What a Combination Utility Means to a Small Town—and other articles dealing with public policy, engineering, and practical operating and commercial work

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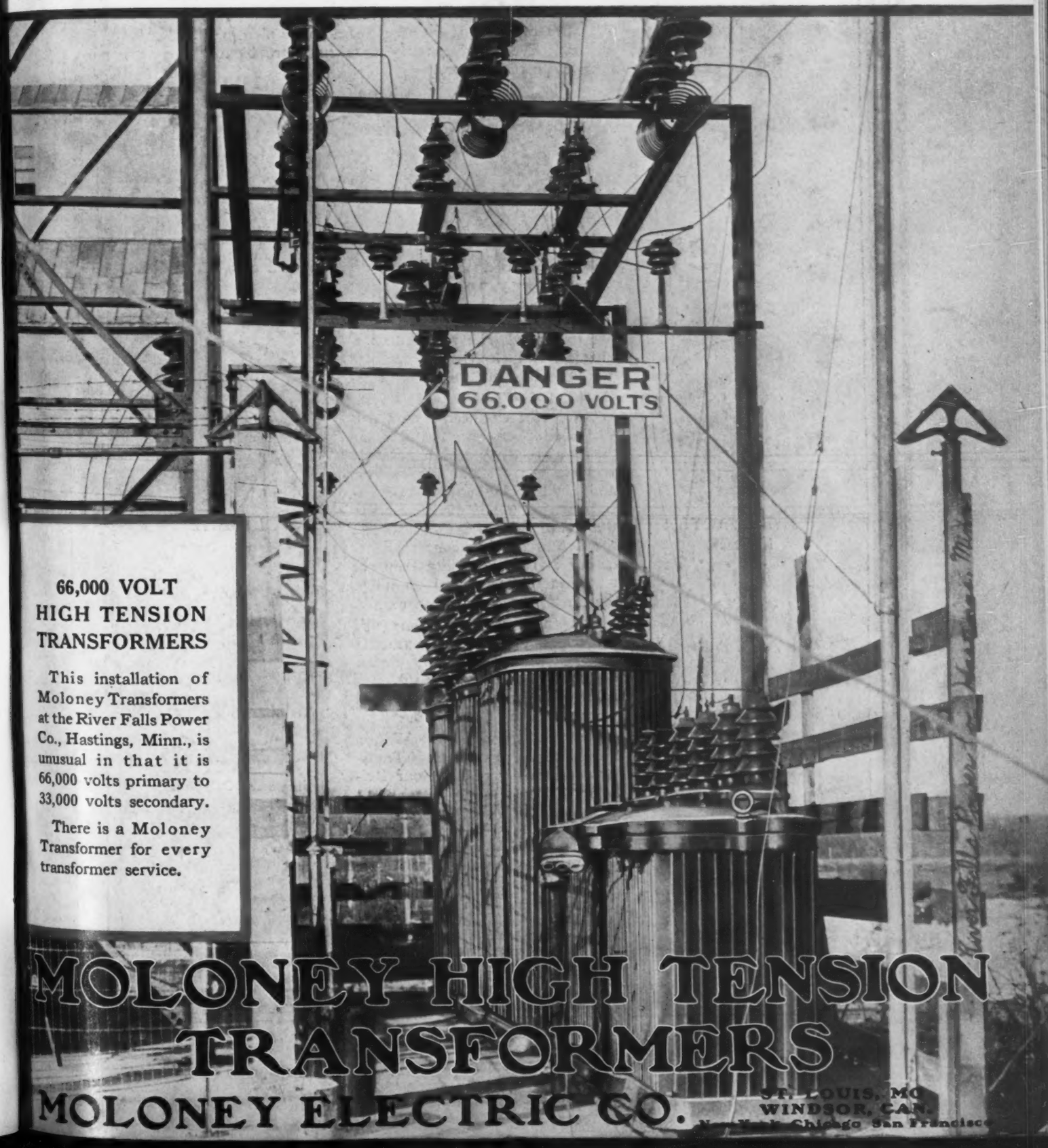
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Electrical World

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The Conservation of Water-Powers

CONVINCED of the necessity for water-power development in the interests of conservation and of national preparedness, the National Conservation Congress in convention assembled this week indorsed in principle two water-power bills now pending before the Legislature at Washington. Following close on the heels of the water-power conferences of the American Institute of Electrical Engineers and of the American Electrochemical Society in the same city last week, the action of the Conservation Congress is ominous. While there may be some question of the propriety of a national body approving or disapproving any particular form of legislation, there can be absolutely no doubt that the conservationists were impressed with the vital need of quick and definite action, and adopted the surest means of making their desires known. The high character and wide range of subjects discussed and the patriotic enthusiasm of the speakers and of the convention as a whole were sufficient to remove this action of the Conservation Congress from taint of suspicion. Now that light and understanding have been freely imparted on the situation, action should no longer be deferred.

Publicity for Corporations

PUBLIC utilities should have a wider appreciation of the value of presenting the facts in regard to their activities to the public. Otto Kahn, speaking before the Newspaper Publishers recently, advocated the full publicity in the largest financial affairs. He made the point that the old furtiveness, the old seclusion, the old mistaken sense of dignity in refusing to let the public know what is going on must disappear. Public confidence, as he expressed it, is the breath of life for finance. We commend this policy toward publicity to the attention of all managers of public utilities. We commend it with a knowledge that in the past managers of business enterprises have had reason to withhold information because of its use by unthinking and, to be charitable, unintelligent men. But we believe a change has taken place in public sentiment and that business in general may now expect fair treatment on the part of the public press. A glance at the general magazines of popular circulation will indicate the change in the public's attitude toward business. Publications of this character depend for their circulation upon "appeals" to public attention. These bids for interest have passed through several stages. Not many years ago "muck-raking" was the slogan of the popular magazine. Sensational attacks on business enterprise provided the public with "interesting" reading. Muck-raking built big circulations. But a reaction followed. The public discovered that overplayed abuses of a few business enterprises were not indicative of rottenness in all business. They lost interest and circulation fell. Then the salacious story was seized upon to make the popular magazines a news-stand favorite. Thinly-veiled ladies illustrating even less thinly-veiled sex stories drew the morbid interest of thousands; but only for a while. The public as a whole demanded decency in its reading and the sex appeal lost ground.

All this by way of preface to what seems to be the newest tack of the general magazines to find another editorial "appeal." A casual reading of half a dozen of the general magazines indicates that their editors are now looking for business and trade articles—stories which tell how American men can run their business at a profit, how to organize and how to develop business, how to become successful in business, and so on.

Magazines of general circulation, in short, are reflecting the desire of the public to want to know more about business operations. The public has discovered that business is a great constructive factor in our national life, and the editors are attempting to reflect the public's desire for facts about business. This is an encouraging sign of the times and we recommend its serious consideration to the management of public utilities. The time is ripe for a freer interchange of thought between the representatives of large enterprises and the public.

Summer Work for College Students

AHEAD of the graduates in our schools and colleges is the summer vacation. Many students in engineering schools belong to that group of men who earn their education by vacation work. What to do is always a problem. In a few of the engineering schools summer work of an engineering character is accepted as an alternative for "shop practice" or "laboratory drill." This makes it possible for the student to accrue knowledge and funds at the same time. Lacking this opportunity, however, the student must generally determine whether he will go out for the job that pays the most or take the one in which "experience" in his own chosen line is a part of his return. It is fair to say that there is often more money in selling aluminum ware or maps than there is in taking up temporary engineering work. Even if the student must decide on the financial basis alone, it is probable that the knowledge of human nature which certainly results from a

trip "on the road" is an offsetting advantage against the lack of professional engineering experience which follows from sales vacation work. The development of the strictly merchandizing side of the electrical industry is making possible certain classes of work in which both the electrical knowledge of the student and his possible qualities of salesmanship may result in both the money and the experience. Crews of college students have been put out by central stations, for example, to sell household appliances. The men work on commission and in some instances have a weekly drawing account, so that the plan has financial attractions. Aside from the money, however, the fact that the work of selling is close to the applied engineering problems of the electrical industry makes such a venture a real experience to the student who keeps his eyes open.

Electric Service in the Small Town

UNDERLYING and running through the successful development and career of a small Texas utility, as related elsewhere in this issue, is an interesting lesson in the building and maintaining of a small town public service property in such a way as to secure the full co-operation of the public served. The history of this particular plant is ample evidence of the possibility of furnishing the small community with public service conveniences and benefits equal in quality and price to those of most large cities. All this has been possible through the co-operation of the public in fostering what they considered and has truly proved to be a prime factor in the building of home industries. It is self-evident that the general opinion of the sum total of the population served by a public utility is only the composite reflection of the individuals. Fortunately the time is rapidly passing when sane citizens expect or look for personal benefits without giving proper compensation for either merchandise or service.

There was a time when a group of men who attempted to obtain sufficient capital to finance a project for serving the public were accused of combining to rob the public. Public opinion of corporate enterprises was colored by the speculative undertakings of a few. On the other hand, the public was equally misled in forcing exacting and unfair treatment on the corporation. It is, however, being more and more appreciated by the public at large that enterprises that tend to improve standards of living require relatively large amounts of capital, and that men cannot be expected to risk their money and give their talent and services without a proper and sufficient indication of an adequate return. The public utilities in small towns should be given due credit in the working out of these problems. In many instances the hazard and sacrifice of both money and talent have been proportionately greater in these small companies than in most other enterprises.

Aside from these questions of public policy, the management, in starting such a central station plant, must know rather definitely the limits of the town or community as a market. The management must answer such questions as, How rapidly will the town increase in population? How many people will stick to the kerosene lamp and cistern pump because of the higher cost of light and water? How much will the average home owner spend for the benefits of electric service? and, What must be the proper return to maintain an adequate property to furnish service to-day and five years hence as the demand increases? Once established, good management, sufficient enterprise, sincere diplomacy and efficient service will usually result in a satisfactory answer to all these questions through public co-operation and appreciation of a progressive home industry.

Detectors in Radio-Telegraphy

EVER since the introduction of radio-telegraphy, there has been a perpetual debate as to the true physical behavior of the detectors it has employed. It is curious that almost all of the detectors employed have an action sufficiently obscure to open differences of opinion. The magnetic detector is one of the very few that have come to receive a general acceptance, as to the way in which it works. Indeed, no small part of the glamor and fascination, which undoubtedly surround radio-telegraphy, is attributable to the mysterious actions of its detectors. Some amateurs go so far as to say that when these detectors shall all have become explained in a perfectly acceptable and satisfactory way, Othello's occupation will be gone, and they will no longer be interested in radio-telegraphy. If this is a true statement, let us hope for their sake, that the day of perfect enlightenment may always be to-morrow. In science, the philosophy of *mañana* is not all ignoble. In a paper, before the recent Washington meeting of the American Electrochemical Society, by Prof. Wilder D. Bancroft, an interesting theory is presented and offered for the *modus operandi* of electrolytic detectors, crystal rectifiers and coherers, namely, that electric voltage squeezes out, or at least in some way decreases, the thickness of the adsorbed gas film, and thereby decreases the resistance of the detector.

This theory has already been suggested for some one or more of the different detectors included. The novelty of the suggestion lies then in the catholicity and inclusiveness. The paper advocates a doctrine, but unfortunately does not bring forward any new experimental evidence in its support. It would certainly be very desirable to have some experimental proof of this interesting theory. At first sight, one might suppose that it would be easy to invent some crucial experiment, which should absolutely settle the question, and leave the opposing party without hope or possession; but actually, it seems very difficult to frame such a decisive test. Many tests have been applied already, and the results appear to be always capable of different interpretations, according to the theory held by the expounder. Moreover, it is quite likely that the actions in these various detectors are complex or multiple, rather than unique and simple; so that the difficulty lies in determining the respective shares of each action.

It certainly seems reasonable that the adsorbed gas may play an appreciable part in these detectors, in the

manner claimed by the paper; but this is not likely to be the only action taking place. Thus, in all cases, there is a certain amount of heat produced in a highly localized volume. The heat generated in a detector is small; but the volume of material in which it is generated is still smaller; so that the temperature effects are not to be despised. As good a case for thermal action can probably be presented experimentally, in the electrolytic detector, as for the adsorbed gas action. The paper is certainly welcome as a stirrer of opinions, and as a gauntlet thrown to the advocates of thermoelectric action.

Industrial Niagara

THE development of power at Niagara Falls is one of those tremendous and astounding realities which is very imperfectly comprehended by the general public. Niagara started out in its electrical career as the source of power for well-nigh infinite distribution of energy to an almost unlimited territory. In the more than twenty years during which Niagara has been harnessed, it has made, it is true, great progress in the supply of energy to distant points, but not at all to the relative extent predicted at the beginning. In fact, it has turned out that instead of Niagara sending power to industries, these have been brought to Niagara to utilize the power at comparatively nearby points. Enormous industrial establishments of the greatest importance to national life have been built on the basis of power furnished from Niagara over a comparatively moderate area, and if the governments of United States and Canada extend the helping hand the power developments will become of vastly greater value to the public at large. The practical work that has been done in the building up of great and extremely important industries of Niagara can hardly be overestimated. In particular, the chemical industries have under the stimulus of cheap power grown to a prodigious importance. The list of products turned out from the electric furnace is startling in its variety and importance; artificial graphite, calcium carbide, ferro-silicon, ferro-chromium, tungsten, vanadium, and molybdenum alloys for high-speed steels and similar products, ferro-titanium, the aluminum industry in all its ramifications, and the wonderful series of abrasives of which carborundum is a type. Aside from all these products, the chemical industries which depend on electrolytic processes have flourished to an extent which the general public little realizes. Chlorine in many combinations for industrial use, caustic soda, and caustic potash, potassium and sodium chlorates, metallic sodium, invaluable in the sodium cyanide supply for the gold mine, phosphorus for its wide variety of uses, and a long list of other chemical products find the center of their production at Niagara. Beyond this there is still one process, perhaps equal in future importance to all the others, which may find use for all the power which Niagara in the future can spare, that is the fixation of atmospheric nitrogen, either as cyanamid or nitric acid directly, so as to draw from the air for the use of the farmer and the chemical manufacturer that nitrogen which is indispensable to both.

Governments and industry should co-operate to realize to the full the resources of the Niagara industrial unit. Niagara has already brought enormous benefits to the country which would be acutely realized if the products were cut off.

Electrical Displays to Replace Fireworks

IT is not too early to point out again the possibilities this year of substituting electrical displays and electrical pageantry for fireworks in the promotion of a sane Fourth of July. Within a few weeks local committees of citizens in charge of the public Fourth of July celebrations will be meeting in all parts of the country. This year these celebrations will have new meaning and local preparations will be undertaken on a larger scale than usual. Electricity should take its logical part in the displays. Electrical illumination lends itself to both spectacular and beautiful effects. No one who witnessed the Hudson-Fulton celebration of a few years ago, or more recently the night glory of the Panama-Pacific Exposition, could wish to find a less inspiring method of celebrating the nation's birthday. With the opportunities existing for the newer flood-lighting methods, as well as the possibilities of outline and group illuminated buildings, electricity lends itself adequately to the promotion of the safe and sane Fourth. Local electrical men will perform a service as well as develop their individual enterprises by calling attention to the possibilities of applying electricity in this field. Problems in illumination will no doubt be developed, but the ingenuity of those who install the equipment and those who supply the current have overcome obstacles before, and the results are certainly worth attaining.

The Coming Issues

NEXT week in the station operating number of the ELECTRICAL WORLD for May a leading article will take up the subject of smoke and dust precipitation by electrical methods. Another engineering article will deal with the installation of lighting units to satisfy requirements of station illumination, including provisions for lighting switchboards, storage-battery rooms, high-tension rooms, boiler rooms, etc. Operating men will find of particular interest the discussion of lubrication problems in connection with the operation of steam turbines, engines, bearings and rope and chain drives, to appear in the same issue. The number will include the regular departments for the engineer, the central station man, the contractor and the dealer. The following issue, May 20, will be the pre-Convention number, with special articles of timely significance in connection with the Chicago convention of the National Electric Light Association, and the issue of May 27 will be the convention report number.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

Conservation Congress Indorses Water-Power Bills

Report of Majority Committee on Water-Powers Favoring Shields and Myers Bills Adopted After a Stormy Session

After a long and bitter debate in which the water-power interests were accused of engineering the Wednesday session of the National Conservation Congress to help their ends, the Congress by a vote of 116 to 39 adopted the majority report of the committee which indorses the Shields and the Myers water-power bills.

The National Conservation Congress convened at the New Willard Hotel, Washington, May 2, 3 and 4, and in view of the crisis which has awakened the American people to the imperative need of immediate steps toward greater national strength and efficiency, all of the deliberations were mapped out with a view to evolving a practical plan for the mobilization of the country's resources for whatever purposes they may be desired. The morning, afternoon and evening sessions of Tuesday were devoted to topics bringing out the idea of patriotism for national development. The sessions on Wednesday were devoted in part to plans for the mobilization of the country's resources, and data on these from authoritative sources of the government and from experts outside the government were presented. On Thursday the conservation of human efficiency was considered. The evening sessions were given over to illustrated lectures with motion-picture films. The development of water-powers was considered prominently in its relation to the production of nitrate. The report which was so viciously attacked was only part of a report of a committee on water-power, nitrates and phosphates of which B. M. Hall of Atlanta, Ga., was chairman.

The conservation problems of New England, the northern Appalachian belt, the southern Appalachian belt, the South Atlantic belt, the Gulf plains, the Central plains, and the Great Lakes, the great plains, the Rocky Mountain basins and plateaus, and the Pacific Mountains and valleys were outlined at the Tuesday afternoon session, and on Tuesday evening H. J. Pierce of Seattle, Wash., gave an illustrated lecture on the water-power resources of the country and the manufacture of atmospheric nitrogen. This lecture was similar to that presented before the meeting of the American Electrochemical Society in Washington and reported last week.

Prior to the presentation of the report of the committee on water-power on Wednesday morning, reports were presented by committees on soils, on iron, on mineral fuels, and on forests. Prof. J. W. Toumey of Yale University, who reported for the committee on forests, showed to what extent these help to regulate the flow of water in streams and conserve the resources of the country. He recommended that the government adopt a permanent policy of acquiring land in the Appalachian region by purchase and in the Western forests by consolidation and extension. With a view of regulating the flow of water in streams he also recommended that the government acquire control of all of the mountain forests.

The skirmish regarding the indorsement of the water-power bills began at the Wednesday morning session; the jockeying for position of advantage having been begun by the minority committee on water-powers which sought, but without success, to have its report held over for the afternoon session.

Report of Majority Committee on Water-Powers

After giving statistics on the water-powers of the country, based on reports of the geological survey, of the Commissioner of Corporations, of the Forest Service, and from statistics of operating companies, the committee showed that in advocating a policy of power conservation there must be a fine adjustment between water-power development which is thoroughly practicable and that which becomes impracticable by reason of the fact that fuel power can be produced at a lower cost. Summing up the whole matter and having due regard for the present vital needs for power development as related to national defense, the cost of food and comfort and convenience in all departments of life, the committee said that it believed that its duty would not be completed unless it made definite and concrete recommendations as to the future. This course, it maintained, did not necessarily involve participation in political issues or any unwarranted interference with legislature procedure. In its estimation, the two Senate bills now before Congress dealing with water-powers comprise the best thought of the day and represent reasonable common ground upon which all may safely stand, for the present at least. It therefore presented the following recommendations to the delegates. "In view of all the acute necessities of the present, we urge such action by the Congress of the United States as will result in immediate water-power development, and inasmuch as the Myers bill and the Shields bill" (the one dealing with water-powers on the forest reserve and the other dealing with water-powers on navigable streams) "contain provisions adequately safeguarding the interests of the public and the rights of investors, we hereby indorse both these measures in principle and express the hope that they may be speedily enacted into law."

Minority Opposes Leases

As a substitute for the majority report, the minority report, which was presented by E. C. Finney of the Interior Department, offered a set of resolutions which declared that "the Congress believed undeveloped water-power sites should not be disposed of in perpetuity but should be retained in federal control to be developed and used under such liberal rules and for such certain and definite tenure as will enable and will encourage the use of private capital therein, and that the development shall be under such public control that the consumer, operator and investor all will receive fair treatment."

Debate on Recommendations

Following a brief address by Dr. W. L. Saunders of the Naval Consulting Board, who sounded a warning that conservation should be promoted in the interests of preparedness, the fight on the water-power measure began. Prominent among those taking part in the debate were Gifford Pinchot, former chief forester; James R. Garfield, ex-secretary of the Department of the Interior; C. A. Merrill, chief engineer of the Forestry Bureau; M. O. Leighton, consulting engineer; Dr. A. S. Cushman, prominent agriculturalist; J. H. Finney of the Aluminum Company of America, all of Washington.

D. C.; ex-Governor J. H. Hawley of Idaho; Hugh Cooper, consulting engineer of New York City; Dr. G. E. Condra, Lincoln, Neb., chairman of the executive committee of the National Conservation Congress; President E. L. Worsham of Atlanta, Ga., president of the Congress; M. L. Alexander of New Orleans, La., chairman of the credential committee.

The assertion was freely made by the opponents of the majority report that the convention was packed by the power interests. Mr. Merrill explained the differences of the Shields bill, the Myers bill, the Ferris bill and the Adamson bill. He maintained that the Shields bill and the Myers bill would grant perpetual water-power rights to private corporations. No limitation is placed by those measures, he said, upon the period in which a grantee can hold a power site under federal permission, but the period in which the government can claim such grants is placed at fifty years. The Ferris and Adamson bills, he said, provide that the government in taking over such power plants should pay only the actual value, while the Shields bill permits the water-power grantee to set an increased valuation for sale back to the government upon what he may obtain without cost from the government.

PINCHOT ATTACKS SHIELDS BILL

Ex-Secretary Garfield, in an address against the Shields bill, said that it threatens to place in private hands the protection or destruction of the beauties of the Grand Canyon of the Colorado. Mr. Pinchot, who led a similar fight against water-power measures in the Conservation Congress three years ago, declared that the steps that the Congress was asked to take were along the lines on which all the great trusts had become possible. Water-power bills fair to all have been introduced during the last eight years, only to be killed by the water-power trusts, which he said, have been fighting for legislation giving them, as does the Shields bill, a perpetual interest in water-power rights. "The primary facts," said Mr. Pinchot, "are few and clear. You either vote against turning over to the great special interests our last natural resource, or you vote to turn it over in perpetuity. That is the issue. This is the close of a great campaign that has been going on to give the country's power into private hands. It is the most vigorous campaign I ever saw by a group of men to get public property into their possession. Representatives of the special interests are here in force and perhaps in control."

Ex-Governor Hawley of Idaho told of what hydro-electric energy had done for Idaho and how greatly legislation was needed to permit development of the water-powers and thus in turn add to the physical comfort and prosperity of that State. "What the country needs," said the ex-governor, "is immediate legislation that will permit development of water-power. For eight years there has been a campaign of water-power destruction. It has reached the point where it defies every right of capital and all common sense." Dr. Condra, made a strong refutation of the charge that the meeting was packed or that the committees were appointed with a view of aiding the water-power interests. The chairman of the credential committee also denied that any favors had been shown in naming delegates of committees, and stated that there was no evidence of the meeting having been packed. When the report was finally placed before the Congress, the vote showed the charge to be untrue. A second vote was taken after Dr. Condra had asked all those who owned stock in water-power companies or who were in any way directly or indirectly interested in a water-power company to refrain from voting. This showed a vote of over two to one in favor of the majority report.

Wire and Wireless Preparedness Test

In order to have a practical tryout of the nation's preparedness for communication in time of war, a telephonic, telegraphic and radio demonstration has been arranged by which the Navy Department at Washington will be put into instantaneous touch with every naval station on the Atlantic and Pacific Coasts, as well as with the battleship New Hampshire at sea. The test will be begun at 4 o'clock this afternoon, and will continue until 8 o'clock Monday morning. During that period, forty hours, the Navy Department will be conducted on a simulated war basis.

Chiefs of the bureaus of the Navy Department will carry on all their business with the important naval stations by telephone, while the Secretary of the Navy, the Naval General Board, the Office of Naval Intelligence and the Chief of Naval Operations at the same time will receive from the New Hampshire wireless telephonic reports of her search for imaginary enemies.

The test was arranged at the request of Secretary Daniels by officials of the American Telephone & Telegraph Company, which has agreed to place its entire equipment and service at the disposal of the government without cost for the demonstration.

Water-Power Association Answers Pinchot

Disposes of Charges Made in His Open Letter to the President Regarding the Shields Water-Power Bill

An open letter addressed to the President of the United States was issued on Monday by the Water Power Development Association urging him to use his influence with Congress in favor of the passage of the Shields water-power bill. The letter also replies to criticisms of the Shields bill made by Gifford Pinchot in a letter addressed to the President on Jan. 29 and declares Mr. Pinchot's assertions to be "incorrect and misleading." The letter of the Water Power Development Association is signed by H. W. Hand, Calvert Townley, W. W. Nichols, Chester W. Larner and J. E. Way, who constitute the executive committee of the organization.

After reviewing the history of water-power legislation and especially of the Shields bill, which passed the Senate by more than a two-thirds vote after nearly a month of consideration by that body, the letter says: "To charge that the Shields bill is the bill of any interest insults not only the Senate and senators but also public intelligence. The Shields bill reflects the view of no one of the parties to this long and complex controversy. It is not even the bill of its introducer, nor of the committee which reported it. It was practically drafted by the Senate itself, in the light of long consideration and thorough knowledge."

The provisions of Sec. 2 calling for large expenditures by the grantees for the erection of locks, etc., are given in answer to the assertion that the bill "gives the use of enormously valuable public property to the water-power interests without compensation." It is denied in the letter that the bill "has been so drawn as to make it practically impossible for the people to take their own water-powers back into their hands." Under Sec. 6 the United States, after fifty years, may take over the development for its own use or for the use of a subsequent permittee. Provisions of Sec. 8 imposing a fine of $1,000 for every violation of the act by grantee, conferring special jurisdiction on United States district courts and stating causes for revoking the grant are cited in reply to the assertion that the bill interposes legal delays between enforcement and violation of permit.

It is pointed out that Sec. 7 was especially drawn up to provide for uniform accounting and publicity, in contradiction to the assertion of Mr. Pinchot. The charge that the bill "gives to the water-power interests the right to condemn or take any land they choose" is held to be contradicted by the provisions of the second subdivision of Sec. 2. That the Shields bill forces the people, when they take back the public property whose use they have granted, "to pay the unearned increment on land condemned or otherwise acquired by the grantee," is denied at length. In the first place it is pointed out that the government on taking back the grant, by the provision of the bill will not have to pay for good-will or any right allowed in the grant. All that will have to be paid for is the property that has been created by the grantees.

Pension System of the Pacific Gas & Electric Company

As a recognition of long and efficient service in the employ of the company, the Pacific Gas & Electric Company, within the last few weeks, has inaugurated a system of pensioning off employees who either through age or through physical or mental disability or who shall have been injured in the employ of the company will be retired by the company at a reduced salary. The effect of the action which has just been taken will date back to Feb. 1, 1916.

In its announcement of this plan to the heads of departments, district managers and district superintendents, the company through John A. Britton, vice-president and general manager, states that it is the desire of the executive committee of the board of directors of the company "to recognize in some substantial way the long service of employees in the interest of the company, and therefore to put into effect a plan of pensions which will be standard in character." The company has for many years taken care of its loyal and devoted employees by retiring those who have been incapacitated through injuries or by reason of infirmities of age on a pension sufficient to maintain them in the necessities of life.

A set of rules and regulations have been drawn up and will constitute a permanent pension system for the company. This system will be managed by the executive committee which shall have power to make and enforce rules and regulations, to determine the eligibility of employees for allowances, to fix the amount of allowances and to prescribe the condition under which such allowances may inure. The benefits of the system will apply to those who are now or may be at some later time in the service of the company and who have been required to give their entire time to the business of the company or to some subsidiary of the company.

Those employees who shall or may be retired and pensioned are of three classes: (1) Any officer or employee who attains the age of sixty-five years after fifteen years of continuous service; (2) any employee, after twenty years of continuous service, who may become unfit by reason of permanent physical or mental disability from following his usual employment in the company's service; and (3) any employee, after ten years of continuous service who, in the opinion of the company's medical examiner, shall become incapable of continuing his service by reason of injuries received while actually at work in the company's employ.

Rules are given showing when the retirement of the employees shall take effect and how to compute the terms of service. The terms "service" and in the "service of the company" are defined.

Authorized pension allowances are upon the following basis: For each year of service an allowance of 1.5 per cent of the average regular monthly pay received for the last ten years preceding the retirement; provided, however, that in no case shall the pension allowance for an employee whose entire time has been given to the company be a less amount than $15 per month. Allowances are to be paid at the end of each month during the life of the beneficiary, except in case of incapacity due to injury, provided, however, that the company may withhold the pension allowance in cases of gross misconduct. A pension payroll is provided for.

It will be the duty of each official of the company to see that employees of the ages mentioned are given a pension. The secretary of the committee must keep himself posted as to the whereabouts of the pensioned employee. Pensions are not assignable. The acceptance of a pension allowance, except those who are injured in the employ of the company, shall not debar a retired employee from engaging in any other business, which in the opinion of the executive committee is not prejudicial to the interests of the company, but he shall not be entitled to re-enter the service of the company in any capacity.

While establishing this system, the company makes it clear that it in no way makes a contract with the employee. It is merely the intention of the company to declare the present policy of the company and to give authority and instructions to the officers of the company to carry out this policy.

A.I.E.E. to Hold National Meeting

Voicing the new spirit of nationalism, the American Institute of Electrical Engineers will hold simultaneously—by means of long-distance telephone service—in San Francisco, Chicago, Atlanta, Philadelphia, New York and Boston, a national meeting on May 16. Engineers from all over the United States are now assisting the War Department in the promotion of industrial preparedness, and the Institute felt that the present time, therefore, is very opportune for emphasizing the national scope and spirit of that body. The entire spirit of the meeting will be national.

Each person attending at the various places will be provided with an individual telephone connection, so arranged that every meeting is simultaneously in touch by wire with every other meeting.

President J. J. Carty will open the meeting from New York, and will be followed by Secretary F. L. Hutchinson, who will read the minutes. The business of the meeting will then be taken up. Motions made on the Pacific Coast will be seconded on the Atlantic, and a vote by telephone taken. There will be, therefore, the regular parliamentary action incident to a business meeting, in which it is desired that all sections will participate.

Thomas A. Edison will greet the whole Institute, after which each section will entertain the others with national airs, appropriate historically to the section rendering them. Dr. Alexander Graham Bell, Theodore Newton Vail and Ralph Pope, honorary secretary of the Institute, are also expected to say a few words to the Institute. Prof. M. I. Pupin, in the name of the electrical engineers, will greet all members of the different branches emphasizing the national spirit of the engineering profession.

The Boston, New York and Philadelphia meetings will start at 8.30 p. m., Atlanta and Chicago at 7.30 p. m., and San Francisco at 5.30 p. m. In Boston the meeting will take place at Franklin Union, in New York at the Engineering Societies Building, in Philadelphia

at Witherspoon Hall, in Atlanta at Taft Hall, in Chicago at Congress Hotel, and in San Francisco at Native Sons' Hall.

During the meeting there will be a half-hour period when each of the separate meetings will be addressed individually by some noted educator. These addresses will not be sent over the telephone. They will be untechnical, and while the subjects have not as yet been announced, it is understood that they will deal broadly with the achievements and accomplishments of national and world character that have been effected either in the field of or by the aid of electricity.

Dr. A. Lawrence Lowell, president of Harvard University, will address the Boston meeting; Dr. Henry S. Pritchett, president of the Carnegie Foundation, will address the New York meeting; Dr. Edgar F. Smith, provost of the University of Pennsylvania, Philadelphia meeting; Dean C. E. Ferris, engineering faculty of the University of Tennessee, Atlanta meeting; Dr. Harry Pratt Judson, president of the University of Chicago, Chicago meeting, and Dr. Ray Lyman Wilbur, president of Leland Stanford, Jr., University, San Francisco meeting.

Satisfactory Ways for Grounding Electrical Systems

Effects of Grounds to Water Pipes, Driven Pipes and Plates and Regulations for Grounding Methods Embodied in National Electrical Safety Code Prepared by Bureau of Standards

At the Engineering Conference held at Atlanta, Ga., May 4, a paper on the grounding of electrical systems prepared by the Bureau of Standards was presented in which methods for the protection of persons and property against electrical dangers were reviewed. It was pointed out that one of the most important sources of danger is that due to the close proximity between high-voltage and low-voltage circuits in transformer windings, on pole lines, in manholes, and other places where, because of lack of space or for other reasons, it is necessary to place such circuits near each other. The actual hazard in this case arises from the entrance of voltage and current from the high-voltage circuit upon the low-voltage circuit through faults in insulation, contacts between wires and the like. Much can be accomplished when installing such low-voltage circuits to make them safe by grounding the circuits themselves and also the non-current-carrying parts of many forms of electrical equipment. Where low-voltage circuits are fed from high-voltage alternating-current distribution circuits through step-down transformers, leaks in transformer insulation are caused in most cases by lightning striking the line and puncturing the insulation between windings. Contacts between wires result from storms, electrical accidents to cables, and other causes. While improvements in lightning arrestors, transformer insulation and construction of lines and circuits, have reduced the possibility of danger to a large extent, complete protection is not yet obtainable. Where a failure of insulation or where contact between high and low-voltage wires occurs there is danger to persons coming in contact with lamp sockets and other appliances, for if the low-voltage circuit is insulated from earth, or even accidentally grounded through a high resistance, a difference of potential between low-voltage circuit and ground may exist, of which the value may range anywhere up to the full voltage of the high-voltage line, depending upon the conditions of the cross between the circuits involved. Even with the high-voltage line thoroughly insulated at all points except the one where failure has occurred, the current flow to ground, due to electrostatic capacity effects, may be sufficient with a few miles of line to be dangerous to both life and property. These dangers can be practically eliminated by connecting low-voltage circuits and the non-current-carrying parts of electrical equipment and apparatus to earth through a low resistance. That is, a current may easily pass from the low-voltage circuit into the earth in case of an accident to insulation. If the resistance to flow of current is low enough, a dangerous voltage cannot exist between low-voltage circuit and ground.

GROUNDING TO WATER PIPES, DRIVEN PIPES AND PLATES

It was emphasized that the most important question connected with grounding schemes is that of obtaining a low value of resistance for the earth connection. Electric circuits can be grounded, by utilizing water pipe systems, driven pipes or buried plates. However, water pipes easily come first in point of desirability. In the first place, on account of their great extent they offer but little resistance to flow of current away from them into the earth, the resistance of water pipe earth connections being found to be but a fraction of an ohm in most cases. A resistance of 2 ohms would be extraordinarily high. Where these low resistances are found the pipe joints for a considerable distance from the earth connection must give as good metallic contact as will ordinarily be found with lead or screw joints. In the second place, water pipes are easily accessible at service pipes or other places, and in the third place, it can be shown that with certain precautions covered in the wording of the rules of the national electrical safety code all possibility of damage to the pipes, or injury to employees of the water company, can be easily avoided.

With driven pipes or plates, a certain degree of protection may be obtained, and in the case of small transformers or lines of limited capacity the protection thus obtained may even be ample. As the kilowatt capacity of the lines and transformers increases, however, the resistance required of the earth connection must decrease. The practicable limit of decrease of resistance with driven pipes or buried plates is soon reached, and for circuits of large capacity some other means must be found if possible. The most obvious solution of the problem is to use the water-pipe systems, covered by the electrical systems. On account of the fact that water pipes give a much lower resistance than pipes or plates, grounding of secondaries to the water systems is highly advantageous to the consumer and the public.

EFFECT ON WATER PIPES OF USING THEM AS EARTH CONNECTIONS

It has been stated that earthing electrical systems to water pipes would cause trouble to the water company in three ways, viz., electrolysis by stray currents from the circuits earthed in this manner; danger to persons who might have occasion to work on the water pipes to which earth connections were made, and complications from allowing a second public service company the use of the pipes.

Experiments conducted at the Bureau of Standards show that the damage due to electrolysis by alternating current is but a fraction of 1 per cent of the damage done by direct current of the same magnitude in point of quantity of electricity passed. No appreciable electrolytic damage from them need, therefore, be feared by water companies. Danger to employees of the water system can also easily be avoided by the electric company removing earth connections when work is to be done on pipes and replace them when the work is completed. With multiple earth connections, however, even this precaution is hardly necessary. Multiple earth connec-

tions of low-voltage alternating current circuits are therefore to be recommended. For direct-current circuits they should be avoided because of the possibility of electrolysis effects.

EFFECTS OF INSULATING JOINTS

In connecting a low-voltage circuit to a pipe system at more than one point, it is important where direct-current railway systems are in the vicinity, that there be no insulating joints in the pipes that may come between the points of connection. If insulating joints are present the low-voltage circuit will act as a shunt to the joint and heavy current flow over the wires may follow if stray currents from street railways are on the pipes. Moreover, if there are insulating joints near a point where an earth connection is made to a service pipe, the joints may so restrict the useful pipe surface in contact with the soil as to cause the resistance to flow of current from the low-voltage circuit into the earth in case of accident to insulation to be so great as seriously to impair the usefulness of the earth connection. In making multiple earth connections care should be taken to see that stray currents from water pipes do not get on the wires, at least to any appreciable extent. The example of the insulating joint given above is one illustration.

JOINT USE OF EARTH WIRES

It has been in many cases recommended that to save expense a single earth wire may be made to serve several different classes of apparatus or circuits; for example, a lightning arrestor and a low-voltage circuit. In the event of a discharge of the arrestor, however, a high potential difference is likely to exist between the ground end of the arrestor and ground. This potential is impressed upon the low-voltage circuit, and may be a source of danger to persons, or present a fire hazard. For this reason separate earth wires should, in general, be provided for all classes of apparatus, but particularly for lightning arrestors, and where earth connections other than water pipes or other extended electrodes are used the arrestor should also be provided with a separate earth connection spaced at least 5 ft. from those serving low-voltage circuits as required by Rules 95a and 95b of National Electrical Safety Code.

CONNECTIONS TO GAS PIPES

Connections to gas pipes should be prohibited except in special instances as provided in Rule 93. The reasons for this are as follows: In the first place, gas mains are laid with insulating joints which are extremely undesirable in a pipe line to which earth connections are to be made. In the second place, if a gas pipe in which even a small current is flowing, is disconnected, a spark may follow and cause an explosion or a fire. In the third place, where there are gas pipes there are in nearly all cases water pipes, so connection to gas pipes is unnecessary.

Record Mass of Material for Presentation at Coming Convention

The mass of material to be presented at the coming convention of the National Electric Light Association to be held in Chicago during the week of May 22, in the form of papers, reports, addresses, etc., is a record breaker. Not less than 1500 pages of association material proper will be presented in addition to about 500 printed pages of electric vehicle section material, making in all a total of about 2000 pages, most of which have already been printed. Exclusive of the twenty-five electric vehicle papers and reports, fifty papers have been printed already.

There will be distributed in advance of the convention to members of the association, 100,000 copies of papers and reports. The papers and reports to be presented have necessitated the making of 525 new cuts.

Manufacturers of Fan Motors to Meet

There will be a meeting of the manufacturers of fan motors to consider the formation of a section in the Associated Manufacturers of Electrical Supplies at 10 a. m., on Wednesday, May 17, at the Hotel Biltmore, New York.

This meeting has been called by the general secretary of the association, Charles E. Dustin, at the request of a number of manufacturers, and it is believed that the section will be one of considerable importance and prove of advantage to the members. All manufacturers of fan motors will be welcome at this preliminary meeting.

The board of governors of the Associated Manufacturers of Electrical Supplies will hold a meeting on Wednesday, May 17, at the Hotel Biltmore, New York.

Binghamton Capitalization Case Settled

The long pending capitalization case of the Binghamton Light, Heat & Power Company was settled on April 13 in an opinion by Chairman Seymour Van Santvoord of the Public Service Commission for the Second District of New York, permitting an issue of more than $1,000,000 of bonds and preferred stock with which to make improvements to the generating station, refund outstanding bonds and preferred stock and discharge promissory notes. The issue of the securities is permitted only subject to very rigid requirements for the amortization of a $600,000 suspense account for replacements and depreciation. These requirements, in the chairman's opinion, will meet the construction of the law made by the Court of Appeals in a previous application of this company for similar financing.

The commission authorizes the company to issue $798,000 5 per cent thirty-year first mortgage bonds under a mortgage to the Guaranty Trust Company of New York, $500,000 of which must be sold at not less than 90 and $298,000 at not less than 87.5, and $280,300 of its 6 per cent cumulative preferred stock to be sold at par. These two issues will net the company a total of $991,050.

Of this sum $77,000 will be expended to purchase a new 3500-kw. turbine, generator and appurtenances; $288,338 will be used to discharge promissory notes; $150,000 will be exchanged par for par for outstanding 6 per cent preferred stock; $449,000 for the reacquisition of outstanding 5 per cent bonds, and $26,000 for working capital.

For the first two years after these securities are issued the company must amortize its depreciation and replacement suspense of $600,000 at a rate of $7,500 a year. But after that it must again come to the commission for instructions as to how to amortize this on a schedule which will, it is hoped, show better results.

By this method, in the opinion of Chairman Van Santvoord, the objections to the method prescribed by the commission in this case in 1910, which was rejected by the Court of Appeals, will be met.

"To deny the right of the corporation," he says, "to issue securities under such circumstances—which would be equivalent to denying the authority of the commission to approve of such an issue—would inevitably result every now and then in throwing into bankruptcy corporations which have been temporarily un-

fortunate in their business operations, under circumstances which would not only do violence to both the judgment and sense of justice of the commission, but which would operate to the disadvantage of both public and private interests involved. This commission unanimously and unhesitatingly affirms its conviction that the public service commissions law authorizes it to approve of the issue of securities for the purpose of maintenance of service and making replacements, provided that such purposes are expressly and distinctly stated and certified in the commission's order of approval and the transaction is safeguarded by requirement or provision for due and timely amortization or other extinguishment of the charges thus created—as also its understanding and belief that the Court of Appeals has never questioned or intended to question such authority."

Changes in N. E. L. A. Convention Program

The only changes that have been made in the program of the thirty-ninth annual convention of the National Electric Light Association to be held in Chicago during the week of May 22 have been the addition of a paper by Ell C. Bennett on co-operation between the National Electric Light Association and the Jovian Order and instead of having the first company's section meeting on Thursday afternoon and the second one on Friday morning, it is now proposed to have these sessions on Tuesday and Thursday afternoons respectively. This will give no fewer than four sessions on Thursday afternoon. Mr. Bennett's paper will be read at the general session on Wednesday morning.

Bureau of Standards Engineering Conference

With 200 prominent engineers, municipal electricians, city water-works engineers and public utility officials attending, the convention of the Bureau of Standards and Affiliated Technical Societies of Atlanta, Ga., opened on May 2 at the Georgia Terrace Hotel, Atlanta, to last for three days.

The convention opened with an address by A. M. Schoen, chief engineer of the Southeastern Fire Underwriters' Association. Dr. E. B. Rosa, chief physicist of the Bureau of Standards followed with a comprehensive statement of the purpose of the national electrical safety code. He outlined the means adopted to make it adequate and reasonable, the co-operation received from all interests, and the present status and recommended trial application of the code. W. J. Canada, electrical engineer of of the Bureau, then presented a summary of the code, and read in brief the rules of Part 2 on line construction. Those taking part in the discussion were W. G. Claytor, Roanoke, Va.; P. A. Tillery, Raleigh, N. C.; H. A. Palmer, Richmond, Va.; L. V. Sutton, Raleigh, N. C.; E. P. Peck, Atlanta, Ga., and Mr. Cummins, Birmingham, Ala.

The prohibiting of soft copper by the code occasioned some objection which, however, was largely modified after the reasons of the bureau for such rules and the results of bureau tests on copper splices had been given, including an exhibit of tested samples prepared and explained by E. R. Shepard of the bureau. Some objections to the amount of sag were also brought up in the discussion and the requirement for longitudinal strength of crossing supports was also criticised. In general, those present at the meeting evidenced an attitude that most of the rules of all parts of the code are acceptable, and that the code substantially in its present form deserves a field trial with the best co-operation of all interests.

The evening of May 2 was given over to an exhibition of moving pictures of the bureau laboratories and a lecture on the work of the bureau by Dr. Rosa. The conferees enjoyed also a late afternoon trip to the Atlanta outdoor high-tension substation of the Georgia Railway & Power Company, where a demonstration by the engineers of the company was given of changing insulators and other operations on 110,000-volt lines and the tagging of circuits. All operations were in accordance with the requirements of the safety code.

Papers on "Electrolysis and Its Litigation" and on "Grounding of Electrical Systems" were presented at other sessions of the conference. An abstract of the latter is published elsewhere in this issue.

Propriety of Engineering Charge Explained

At a recent hearing before the Massachusetts Gas and Electric Light Commission, which is sitting as an arbitration board to determine the fair price of street lighting at Boston, the question arose as to the propriety of including an engineering charge for line construction, when such construction is performed for the Edison Electric Illuminating Company by a contracting firm. The company's electrical engineer, L. L. Elden, testified that the contract price for such work by no means covered its whole cost to the central station. Before a foot of wire can be strung, the company has to file an application and plans with the administrative authorities in the district concerned, conduct a hearing and get permission to do the work. All the material has to be purchased by the company and handled in its stock department; the material then must be delivered to the contractor at a substantial outlay. The company is obliged to go into the field, survey the route of the line, stake it out and again obtain the approval of the municipal authorities as to the exact detailed location to be followed. After this, the contractor begins work, but on the responsibility of the central station; and this means that the question of interference with the poles and wires of other companies and of objects on the streets must be cared for by the Edison company, which must make a contingency allowance covering possible damages to other structures arising in the course of the work. To meet all these sources of outlay an engineering charge is absolutely essential, the payment to the contractor only meeting a part of the cost of construction.

Fitting Students for Responsible Positions

Indications that engineering colleges are beginning to recognize the requirements of men in the field are shown by the fact that courses of instruction in different branches of electrical engineering have been completely revised at the University of Michigan so that the students now graduated may qualify for responsible positions in the engineering field. The principal changes have been to require fewer highly specialized studies and to encourage the selection of courses on such subjects as rates and cost analysis, scientific shop management, business organization and management, valuation and estimating, specifications and contracts, and the like. The studies during all except the last year and a half of the engineering course are prescribed and are the same regardless of the degree being worked for. About 10 per cent of the work required for graduation may be elected by the student and includes the aforementioned subjects and courses on the particular branch of electrical engineering which the student wishes to follow. Six divisions of the electrical field have been

made: Communication, machine design, power, railway, illumination and general engineering science. Instead of offering only electrical studies in each of these groups, closely allied mechanical, civil and chemical courses are presented. For instance, theory of combustion-engine operation is offered students in the machine design group and water-power development and utilization of fuels in the power course. Experimental phonetics is offered students in the communication group and history of architecture to those in the illumination group, psychology being offered to both groups. Furthermore, the necessity of being able to express thoughts in good English is being emphasized.

Students in the power and railway groups, in particular, are urged to take fundamental courses in other departments in preference to highly specialized courses in electrical engineering. Those students who desire to specialize are urged to stay in college a fifth year and take up studies which will lead to a Master's degree. It may be pointed out, further, that other professional departments of the college are requiring introductory courses in electrical engineering amounting to about 3 per cent of the total work required for a degree.

In other words, to quote Prof. John C. Parker, recently appointed head of the electrical engineering department and formerly mechanical and electrical engineer of the Rochester (N. Y.) Railway & Light Company, "we are trying to turn out as broad a product as may be."

Last Conference to Be Held on Safety Code

A conference will be held at the La Salle Hotel, Chicago, on Monday and Tuesday, May 29 and 30, upon the National Electrical Safety Code which has been prepared by the Bureau of Standards. Sessions will begin on Monday at 10 a. m.

To this conference are being invited the official representatives of the National Electric Light Association, the American Institute of Electrical Engineers, the American Electric Railway Association, the American Railway Association, the Association of Edison Illuminating Companies, and of several electrical manufacturing associations, the International Association of Municipal Electricians, the Western Association of Electrical Inspectors, the National Fire Protection Association, the National Safety Council, the Workmen's Compensation Service Bureau, the Independent Telephone Association, and of the large telegraph and telephone companies. There will also be present representatives of some of the state commissions, of some of the largest cities, and some engineers with whom the bureau has conferred in the preparation of the code. The attendance is intended to be representative of all interests concerned although it is not a public meeting, and the attendance is not expected to be much more than a hundred. The purpose of the meeting is to consider the code as it is now revised, and this will be the last conference before publication.

In the preparation of the code the Bureau of Standards has conferred with all the interests affected, and has held about thirty conferences in different parts of the country besides numerous informal conferences with small groups. A large amount of work has been done upon the code since the New York meeting of last October, and whereas a very large part of the code has been unchanged since that meeting, there have been a good many changes and developments in some parts, more especially in the section upon overhead lines. These changes have been submitted for criticism and discussion to a considerable number of conferees, and it is believed that they will be generally approved.

It is expected that the code will be adopted for a year's trial by commissions and municipal authorities after it has been published, with the recommendation that it be observed as far as possible during the first year but that its complete observance will not in all cases be expected until after the experience of a year has shown what, if any, changes would be necessary. This trial year is recommended in order to afford an opportunity for a thorough study of the code in actual use, and of the most practical means of applying its requirements in different cases, not only by the companies and utilities which must observe it but also by the administrative authorities of states and cities who must administer its provisions and by manufacturers and others who must supply the apparatus and materials necessary in complying with the code.

A limited number of copies of the revised code have been prepared for the use of those who attend the Chicago conference, but no copies will be available for general distribution until after the Chicago conference, when the code will be published as soon as possible.

Personnel of Convention Committees

The personnel of the committees with whom will rest the responsibility for arrangements other than regular business details of the thirty-ninth annual convention of the National Electric Light Association, to be held in Chicago beginning two weeks from next Monday, has been announced as follows:

General Convention Committee

Samuel Insull, chairman
Louis A. Ferguson, vice-chairman.
William L. Abbott
Henry E. Addenbrooke
Edwin W. Allen
Bion J. Arnold
Godfrey H. Atkin
William H. Atkins
Alex D. Bailey
Frank J. Baker
Russell H. Ballard
Joseph F. Becker
John A. Britton
S. Morgan Bushnell
Henry M. Byllesby
Edward J. Doyle
Harry M. Edwards
William A. Fox
Gaylord A. Freeman
W. Winans Freeman
John F. Gilchrist
John H. Goehst
Harry L. Grant
Ainslee A. Gray
John H. Gulick
H. Rea Hixson
Sam A. Hobson
Oliver R. Hogue
Dana H. Howard
George A. Hughes
Martin J. Insull
Frederick R. Jenkins
Walter H. Johnson
George H. Jones
Peter Junkersfield
John G. Learned
Willard W. Low
George H. Lukes
T. Julian McGill
Charles A. Munroe
Harry L. Munroe
Homer E. Niesz
Robert S. Orr
William H. Ott
Edward D. Payne
Frederick Sargent
Holton H. Scott
William P. Sidley
Bernard E. Sunny
Victor H. Tousley
Frederick von Schlegell
Herbert A. Wagner
Walter F. Wells
Ernest A. Edkins, secretary
Harry E. Wing, secretary

Finance Committee

John H. Gulick, chairman
Willard W. Low
Bernard E. Sunny

Hotel Committee

Ernest A. Edkins, chairman
Forest J. Arnold
Dana H. Howard
Henry G. Kobick, secretary
William R. White

Reception Committee

Louis A. Ferguson, chairman
Edwin W. Allen
Bion J. Arnold
Henry M. Byllesby
John F. Gilchrist
H. Rea Hixson
Martin J. Insull
T. Julian McGill
Charles A. Munroe
Bernard E. Sunny

Local Industries Committee

William L. Abbott, chairman
S. Moran Bushnell
William T. Dean
Harry L. Grant
George H. Jones
John G. Learned
T. Julian McGill
Frederick von Schlegell

Local Registration Committee

Oliver R. Hogue, chairman
Henry E. Addenbrooke
Charles A. Cummings
Edward J. Doyle
Charles A. Harding
William P. Lyon
William H. Ott

Entertainment Committee

Homer E. Niesz, chairman
Godfrey H. Atkin
Edwin H. Cheney
Morgan L. Eastman
Stephen Gardner
James M. Gilchrist
John H. Goehst
Frederick R. Jenkins
William H. Ott
Edward D. Payne

Ladies' Auxiliary

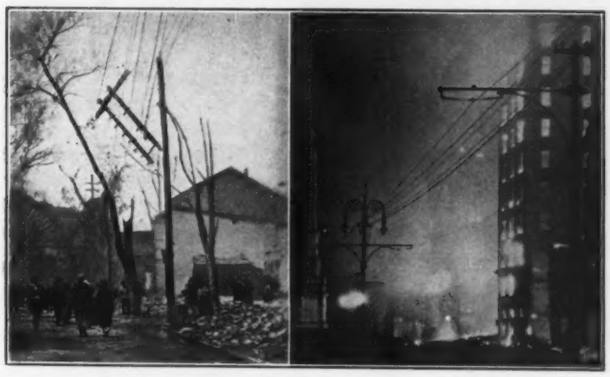
Mrs. Edward W. Lloyd, chairman
Mrs. Godfrey H. Atkin
Mrs. Edwin H. Cheney
Mrs. Ernest A. Edkins
Mrs. Robert L. Elliott
Mrs. Louis A. Ferguson
Mrs. William A. Fox
Mrs. Gaylord A. Freeman
Mrs. Stephen Gardner
Mrs. James M. Gilchrist
Mrs. John F. Gilchrist
Mrs. John H. Goehst
Mrs. Samuel Insull
Mrs. Frederick R. Jenkins
Mrs. Peter Junkersfeld
Mrs. Homer E. Niesz

Local Transportation Committee

Gaylord A. Freeman, chairman
Charles F. Clark
George B. Foster
John G. Learned
Taliaferro Milton

The Augusta (Ga.) Fire Destroyed About $31,000 of Central Station Property

The Public Service Companies of Augusta, Ga., were heavy losers on account of the fire on March 22 which destroyed some $5,000,000 of property including office buildings, cotton warehouses, and residences of thirty city blocks. The Augusta-Aiken Railway & Electric Corporation suffered the heaviest loss of the utility companies in the city, the loss in poles, transformers, meters, wire and equipment as recently checked up amounting to around $31,000. The number of cus-



AUGUSTA (GA.) STREETS SHOWING DAMAGED POLE LINES AND FIRE AT ITS HEIGHT

tomers disconnected totaled 440. The Gas Light Company lost its office and all records through failure of the vault to hold. A large number of meters in the fire district were also destroyed. The loss of the Southern Bell Telephone & Telegraph Company was about 700 telephone installations representing about $12,000. The Postal and Western Union Telegraph Companies lost their entire office equipment, and both companies were forced to maintain telegraph service from the Cotton Exchange and to use tents in the streets for offices until other arrangements could be made.

The damage to the distribution system of the Augusta-Aiken Railway & Electric Corporation included the loss of 238 poles, ranging from 30 ft. to 75 ft., with all equipment. There were fifty-three series arc lamps in the fire district, but these were scarcely hurt other than damage resulting from the fall when the pole burned. There were 293 alternating-current and seven direct-current meters and 105 excess indicators that were totally destroyed. Twelve transformers representing 146 kva. were lost, and $840 worth of material such as ranges, fixtures and the like that were the property of the commercial office stores. Two motor-generator sets and equipment representing $3,035 were destroyed. The cost of line material and labor to replace the equipment mentioned has been $4,558. There was one trolley car burned which cost $3,500. The total reproduction cost is placed at $33,900, of which the car only was insured. Most of the copper in the fire district has been collected, however, and the salvage will result in a considerable credit. The estimated cost to replace the lines destroyed is based on the following figures.

6,800 ft. No. 6 (T.B.W.P.) 2,300-volt single-phase primary wire.
15,000 ft. No. 4 (T.B.W.P.) 110-220-volt two-wire secondary wire.
1,000 ft. No. 00 (T.B.W.P.) 110-220 volt three-wire secondary wire.
900 ft. No. 1 (T.B.W.P.) 110-220 three-wire secondary wire.
88,000 ft. No. 6 and No. 4 (T.B.W.P.) services to 440 customers.
5,280 ft. No. 00 trolley wire.
22,600 ft. No. 6 (T.B.W.P.) series arc circuit conductor.

The total weight of this amount of wire is 35,715 lb. of copper.

Two days after the fire, all customers up to the burned area were receiving service. Street car service was resumed with little loss of time by stringing trolleys on the dead trees. There are plans under way for a new distribution layout of the residential sections, which will call for a rearrangement of the street and alley circuits. The new scheme includes an interior block overhead construction if the present plans are carried out.

Reconstruction After a Recent Fire at Paris, Tex.

In the path of the fire which swept the town of Paris, Tex., on March 21, destroying 1440 buildings in an area of approximately 230 acres, were the old and practically abandoned gas and electric plants of the Texas Power & Light Company, car barns of the Paris Transit Company, and the offices of both companies, all of which were totally destroyed. The financial loss resulting from this destruction was not particularly serious, due to the fact that the buildings and equipment were, to a great extent, covered by insurance. The electric station, which had a capacity of about 900 kw., was used during the heavy-load season as a stand-by, both gas and electric service being regularly rendered by the new plants of the Texas Power & Light Company lying well outside of the fire zone. The latter plant (Diesel-engine-driven units) was described in detail in the March 11 issue of the ELECTRICAL WORLD. Practically all distributing lines and trolley lines in the burned area were destroyed, although the company lost practically no large power consumers.

The lighting company operates a distributing system which permits circuits to be fed from three directions. These circuits are so tied together that in the event of the failure of one, service may be maintained from either of the other two. In spite of the handicap of destroyed lines, service was restored to a portion of the town, not in the path of the fire, five hours after it started. A second portion of the town was reconnected six hours after the fire was under control, and two hours later a third section was receiving service. By evening 75 per cent of the town was connected for lighting, and the company furnished service to all who required it, regardless of the cost of making such connections. Gas service was rendered forty-eight hours after the fire was under control.

The city pumping station, which supplied the water for fire hydrants and in which there are installed two 500 r.p.m. motor-driven pumps, was kept in continuous

RUINS OF STANDBY STATION AT PARIS, TEXAS

service throughout the fire, although a certain amount of handicap was encountered by the fire department due to small pipe lines and the large number of hydrants which were opened at the same time throughout the burning area. Power for driving these pumps is supplied from the Texas Power & Light Company's Diesel station.

The construction of a 60-kv. transmission line from Paris to connect to the Dallas line will be started in the near future, and be completed about Aug. 1.

What Preparedness Means in the Industry

Frank J. Sprague Describes the Work of Men and Resources in the Electrical Industry in the Movement for National Defense—Vital Place of Electricity on the Modern Battleship

THE NEW YORK'S 14-IN. GUNS AFTER FIRING—DURING THE WINTER MANEUVERS MR. SPRAGUE WAS ON BOARD

FOURTH IN A SERIES OF "TALKS IN THE INDUSTRY"

BY FREDERIC NICHOLAS

A national policy of preparedness imposes definite obligations which will be accepted by the electrical industry. What these obligations mean to the manufacturer, the engineer and the trained worker in the industry is the subject of an interview given to the ELECTRICAL WORLD *by Frank J. Sprague. As a member of the Naval Consulting Board Mr. Sprague is intimately connected with the movement for the defense of the nation. A graduate of the United States Naval Academy at Annapolis and a former officer in the Navy, he speaks from personal experience, refreshed by a recent cruise on the battleship New York during the winter maneuvers. As an electrical engineer and as a citizen Mr. Sprague earnestly advocates vigorous preparation for defense.*

"NO man who can read or think should be in doubt as to the necessity for preparedness," declared Mr. Sprague. "We already have an Army and a Navy, and they are certainly not kept for ornament. We are not maintaining the West Point and Annapolis academies, or the coast defense, or the militia, or our fleet simply for fun. They are all rather expensive. They are certainly not kept for offensive purposes; they are purely defensive in character. But it is plain that any kind of defensive equipment that we have should be thoroughly efficient and up to date, and certainly large enough to do what it may be called upon to do.

"The question of preparedness is not a new one. We have always had preparedness in some degree. But the question now is whether we shall augment to the extent that is necessary under modern conditions what we have always had in lesser degree. Shall we continue to live in a fool's paradise, or shall we get ready to protect ourselves against any attempt at aggression? Shall we continue with the pitifully inadequate defenses of the past or shall we have well-balanced and efficient means of protection? What makes the police force of New York City effective is in part its size. If it were one-tenth as large it would fail to be effective, no matter how brave the individual policeman. Surely any man can realize that law and order are upheld because the police force is big enough to respond to the demands upon it. Until we can do away with locks and vaults in the world we cannot do away with our Army and Navy. But both of these instruments of defense are useless unless they are large enough to be effective when they are called upon; in fact, if they are small they are an element of danger rather than protection, because they give a false feeling of security.

THE DUTY OF ENGINEERS

"It is the duty of every engineer in the country—and, after all, engineers are the men most closely identified with the industrial progress of the country, and consequently most responsible for its success—to help the cause by voicing his belief in preparedness and pointing out the dangers of unpreparedness. When war comes it is the business of engineers to mobolize the resources. For every man sent to the front there must be engaged in caring for his comfort, making defense plans and furnishing ammunition from two to three workers in the industrial world. The men and women employed on the great variety of articles now needed in war, for the almost inconceivable output of munition, outnumber the men at the front by 200 to 300 per cent. Without their toil and sacrifice the fighting men would be useless.

"It is unfortunate that there should be a difference in sentiment between the East and the West, and particularly those on or near the coast lines and those in or near the interior. Perhaps this individual feeling may be explained in the same way as a man's personal concern about disasters is affected by his remoteness from them. A railroad accident which we might witness would fill us with horror, but a disaster 1000 miles away concerns us much less. The man in the West, especially the farmer, is a long way from the coast, and cannot be impressed by the fact that his life and property may be affected by bombardment. He cannot picture what would happen if an unopposed fleet bombarded our cities. He seems to be content to take the high prices the war brings for his products and to let the rest of the country 'go hang.' Yet there is not a section of the country which would fail to suffer in the event of a successful invasion of the United States.

MODERN BATTLESHIP A CENTRAL STATION

"Preparedness means a great deal to every manufacturer, electrical or otherwise. It is of most serious concern to electrical engineers. The equipment of ships is now so largely electrical that every augmentation of naval forces, no matter of what character or units—dreadnaughts, battle cruisers, scouts, torpedo-boat destroyers, submarines, etc.—requires more and more electrical equipment. Electricity is used on board ship for a variety of purposes, and to an extent little understood by the public. The modern battleship is really a great central station in which more might be dependent upon the equipment than in almost any other place in the world. It is conceivable that success or failure might be absolutely dependent upon the electrical engineer.

"The electrical equipment on ships is necessarily of more or less special character. It is often subjected, even when used for ordinary purposes, to conditions foreign to land operation, such as salt water spray and air, and vibration, and shock due to gunfire and the straining always found on ship. At the same time the maintenance of absolute integrity of the apparatus is essential. The preparedness policy, therefore, means to the electrical manufacturer not only that he must increase his output in time of public need, but that he must increase the reliability of his products.

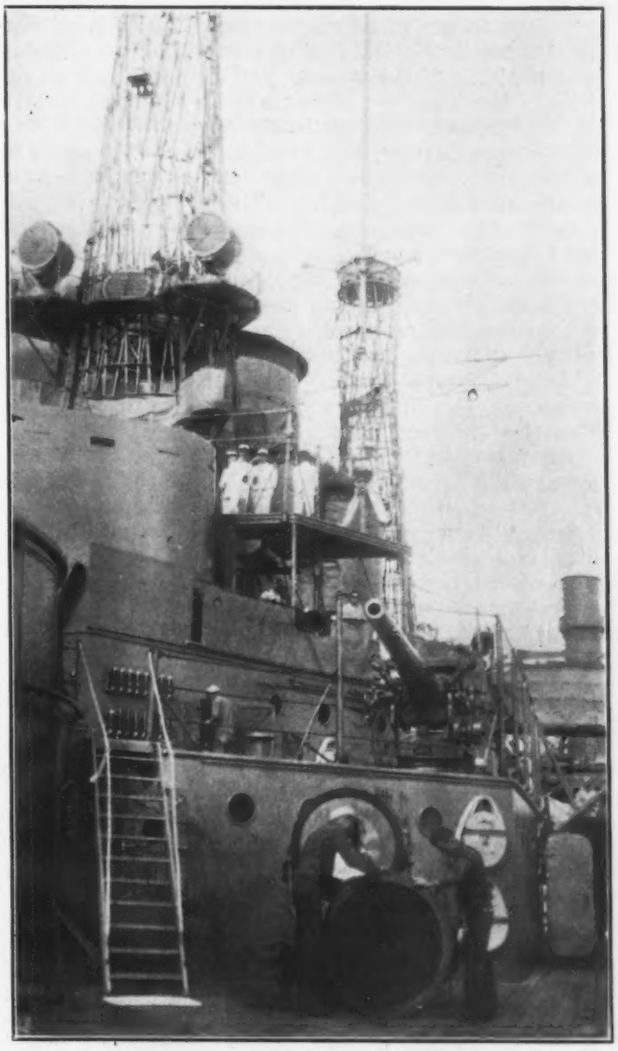
"The necessity of absolute dependability of products in the day of public danger affects the electrical manufacturers of almost every kind of apparatus—telephones, telegraph, wireless, dynamos, lamps, motors, electric cooking ranges, electric steering gear, gyrocompasses, etc. I should say that generally it is simply a question of augmentation of output. Of course the operations in the Navy have nothing to do with the operations on land, where the telephone, telegraph and wireless and the use of electricity for other purposes are quite apparent. There the nation would be likely to use what exists rather than to undertake complete new construction on a large scale.

THE PART OF MANUFACTURERS

"If the necessity arises, many electrical manufacturers are in a position to do an enormous amount of work in the output of munitions. With their organizations of trained mechanics, their tools, capital and resources they have the capacity, should the nation require their aid, for an output of almost incalculable value. This is indicated by the fact that a number of the manufacturers are now turning out ammunition, while one in particular is producing a very large amount. Their usefulness to the country in this respect is not due to the fact that they are electrical manufacturers, but to their tremendous purchasing power, their widespread knowledge of how and where materials are obtained, their understanding as to the treatment of materials and their generally full equipment of information and organization in the ways and means of manufacturing.

"If a crisis should arise there will be important places where central station men can serve. All of these men are more or less trained along mechanical and technical lines, and they will be tremendously useful where work to be done can be coupled with their knowledge.

"Engineers can now do for their country what engineers have never before made a business of doing: they can take part in public discussion, not leaving the direction of public affairs, as in the past, entirely to lawyers and politicians. The average member of Congress is a lawyer out of any other job, hoping to keep his place by furthering the interests of his constituents, generally tapping the pork barrel and trading his influence with another member. They, through the newspapers, have been doing all the talking. It is up to the engineers to realize that the newspapers can talk for them as well as for the politicians. The engineer is more honest in his convictions, more exact in his dealings, straighter in his thinking than most other business



THE MODERN BATTLESHIP A CENTRAL STATION

The modern battleship is a great central station in which more may be dependent on the equipment than in almost any other place in the world. Electricity is used on board ship for a variety of purposes little understood by the public. It is conceivable that success or failure might be absolutely dependent on the electrical engineer. The battleship New York pictured above has a displacement of about 28,000 tons, and propeller power totalling 28,000 hp. Its main battery consists of ten 14-in. guns in five turrets, and the secondary armament comprises twenty-two 5-in. guns.

men—his training makes him so. But for years he has not taken a voice in public affairs. The way for him to have a voice in them is to make the public realize that he has brains. To do this, all that is necessary is that he shall talk and write on public issues.

Government Recognition of the Engineer

"By creating the Naval Consulting Board, and then widening its sphere of usefulness the President and the Secretary of the Navy have done more to recognize the engineer than has been done by the government in the whole period of its 140 years of existence. What body of engineers ever received the wide approval of the press that has been given to that board?

"I believe that engineers should recognize their abilities and do everything in their power for preparedness. They should take as much advantage as possible of the summer camps all over the United States. Their training and education make it easy for them to learn the essentials of command, so that in time of war they can take—not, of course, the places of those long trained to fight, but the duties of reserves. They can make their influence felt enormously if they take the trouble to do it.

"In the future there will be much expansion of electrical operation beyond that characterizing the ordinary industrial life of the nation. For instance, some of the ships of the Navy are more perfectly equipped electrically than others. The battleship New York, on which I made a recent cruise, has, I judge, about 250 motors of various sizes. There is a large field for development in electric propulsion of ships. The equipment for this purpose of the collier Jupiter and of the California, now under construction, was a long step ahead. This development is due more to the individual efforts of W. L. R. Emmet than to anybody else. He worked ten years to convince the government that it was worth a trial entirely at his company's risk.

"Some idea of the power requirements on battle cruisers of the Lion and the Tiger type may be had from the statement that they need over 100,000 hp. Cruisers making 35 or 40 knots per hour would require perhaps 175,000 hp. Personally I think that we would be better off with the equivalent investment in ships making 30 knots per hour, because the strength of anything is limited by its weakest point. I have great hopes of electric propulsion, and do not see anything to prevent successful operation up to at least 100,000 hp.; I do not mean that larger units are not possible, but I think that they are unnecessary.

The Mobilization of Industries

"The mozilization of industries, for which all the necessary information is being prepared by a special committee headed by Howard E. Coffin, is by all odds the most important work that the Naval Consulting Board is now doing. Mr. Coffin is setting an example to engineers which reflects the highest credit on him, and ought to be a stimulus to every one. It is not generally known that the Hudson Motor Car Company spent from $1,500,000 to $2,000,000 in building up an organization around the name of Mr. Coffin as the designer of its product. When he was made a member of the Naval Consulting Board he put an absolute stop to that commercial propaganda without regard to whether it would interfere with the profits of his company. He is now giving practically his entire time to the work of the board, and is effectively aided by W. S. Gifford, statistician of the American Telephone & Telegraph Company, and by over 250 engineers representing the five national bodies in the several States.

"Through the efforts of Mr. Coffin and his associates the Army and Navy heads have been brought together, and all are acting now in hearty co-operation. And despite the fact that the government has not subscribed a dollar to the necessarily heavy expense of the work, it will, in the near future, be in possession of information as to our industrial resources which it could not have obtained through its own agencies without great delay and a much larger expenditure.

Preparedness for Manufacturers

"The manufacturing capacity of the United States exceeds that of all Europe put together, but ordinarily it is largely concerned with the manufacture of products not called for in war, except as the steel and copper industries may be regarded an exception to this general condition. But our other industries are not in a position to swing immediately into the manufacture of munitions, for they are not familiar with it. So one of the objects of the committee headed by Mr. Coffin is to make it possible for the government to place in thousands of shops all over the United States orders for supplies sufficient to enable these shops to establish bases for the manufacture of munitions on a tremendous scale if that should be necessary. They can get gages, men and tools and acquire knowledge of where materials can be bought and how they should be treated. In this way the possible manufacture of munitions, instead of being confined to a few will be universal."

The deep interest which Mr. Sprague feels in the introduction of electricity into the Navy is undoubtedly due in part to his early efforts in 1881 to install electric lighting into the service. Shortly afterwards, when the knowledge of wiring was slight and the materials were of the crudest kind, he installed probably the first electric communicating system on the Lancaster while it was on the way to Europe in 1881. After completing his duty as a juror at the Crystal Palace electrical exhibition, at which practically the entire electrical exhibit was confined to lighting, he successfully urged the introduction of electricity into the service, not alone for lighting, but for many related purposes, such as signals, night illumination, gun-training, and for the use of divers under water.

Investigation of Home Rule for Illinois Utilities

A special committee appointed by the Legislature of the State of Illinois last week investigated the feeling for and against home rule of Chicago utility companies. In its investigation the committee held hearings at East St. Louis, Danville, Peoria and Ottawa, at which the views of local citizens on this question were given.

In summing up the sentiment of the hearings, Medill McCormick of Chicago said: "Our committee will draft several amendments to the present utilities law, and I am hopeful that one of them will give a large degree of self-government to Chicago.

"There has been no evidence of any desire for the abolition of the State commission, or for a return to home rule in communities which we have visited. This is shown by testimony of persons appearing before the commission and by the absence of persons from any distance outside the cities in which we held hearings. They would doubtless have come before us had they been dissatisfied.

"There is complaint that the commission is slow and there is a demand for occasional hearings in certain other cities than Springfield and Chicago. The opposition to local control for Chicago utilities was voiced chiefly by attorneys for public utility corporations."

CONCRETE SETTLING AND COAGULATING BASINS NEAR CAMERON (TEX.). STEAM STATION SHOWN AT LEFT

Growth of a Combination Utility in a Small City

Developments in Growth of Texas Property Furnishing Electric Service, Water and Ice to City of 5000 People, Showing Rôle Played by Efficient Operation and Management

BY DR. ARTHUR CURTIS SCOTT
Consulting Engineer, Dallas, Tex.

TWENTY years ago seven men organized a public utility company in the town of Cameron, Tex., known as the Cameron Water, Power & Light Company, having at the time an authorized capital stock of $50,000, with $17,500 paid in. Cameron is the county seat of Milam County in central Texas, and in 1895 had a population of about 2500. The Brazos River forms the eastern boundary of the county, and the Little River traverses the center from west to east, and passes within about 1 mile of the center of the town of Cameron.

Originally the power plant of this utility for pumping water was located on the bank of the Little River, and operated by steam. In 1900 the light plant of a gin and compress company was purchased and its equipment moved to the pumping station, the combination being operated at that site until 1904. Owing to a number of serious river overflows during that period of operation, and the difficulty of getting fuel to the plant, which was a mile from the railroad, it was decided to move the light plant into the town and operate it in conjunction with a 35-ton ice and refrigerating plant of the Cameron Ice & Cold Storage Company, which company was under the same management as the Cameron Water, Power & Light Company. About three years later the writer made a report on the property for the owners, and considered the equipment of the Water, Power & Light Company to be unsuited to produce adequate financial returns upon the investment.

Lignite fuel was being hauled a mile over a road that was frequently in almost impassable condition, due to water in the bottom lands near the pump station. This fuel was used under steam boilers to operate reciprocating pumps in a pit 25 ft. deep for delivering water from the river into the standpipe in the town against a total head of 247 ft. The 8-in. main leading to the standpipe was laid near the surface, and overflows from the river, and the erratic action of the reciprocating pumps combined to cause leaks and the necessity for frequent repairs, the pumps being chiefly responsible for the trouble. The light plant at that time contained a simple Chuse engine, with a patched cylinder head, belt connected to a 60-kw., single-phase, 133-cycle, 2200-volt alternator. Under such adverse conditions of operation the water plant was losing money, and the light plant had trouble to carry its own burdens.

The writer reported his findings frankly, and included a criticism of the operating engineer as to his care and handling of the equipment. Changes and improvements in equipment were suggested such as to hold expenditures for same to a minimum. The owners finally decided to adopt certain of the changes, and a 100-kw., three-phase, 60-cycle, 2200-volt generator was purchased, with a small marble switchboard to replace an old wooden board previously used. With two exceptions the transformers all over the town were used on the circuit from the new machine, and the circuits were so arranged for a balance of phases that only one day was required to replace the old alternator with the new one, connect up the switchboard and change the outside lines for service. The 133-cycle lighting circuit in the town was cut off at 3 a. m., and the 60-cycle current thrown on at 7 p. m. of the same day, and continued thenceforward without interruption.

A transmission line was built to the pumping station, and a three-phase, 2200-volt, motor-driven, 5-in. three-stage centrifugal pump was installed, the control being located in the power plant uptown. This pump was operated very satisfactorily for over a year, and then another similar pump was installed for reserve service, the old reciprocating pumps and steam boilers being removed from the river plant and discarded. The pump pit was waterproofed and increased in height to prevent overflows of the river from submerging the motors, and subsequently a concrete pump house was built to replace the old frame structure over the pump pit. In 1913, however, the river overflowed to such an extent as to fill the pump pit and reach a height of several feet above the top of it, both inside and outside the house.

The town was not deprived of water entirely, however, at this time, as settling basins had been built uptown, and the supply there was sufficient for several

days. The pump motors were dried out immediately after the flood had receded, and the pumps placed in operation before the basin supply had become exhausted. These basins serve a twofold purpose in permitting the treatment and clarification of the water, and in providing a reserve emergency supply for several days independently of the standpipe capacity, which is 173,000 gal.

STATION EQUIPMENT

After the installation of the 100-kw. unit heretofore referred to, it became necessary in the interests of economy of operation to place a jackshaft, to be driven by the ice machine engine, in the plant for operating the generator on light loads, instead of using the wasteful Chuse engine at all times. Later, in 1911, business had increased to such an extent as to require a large unit, and a direct-connected, 200-kw., four-valve, tandem-compound, engine-driven unit was installed. A new switchboard was purchased at the same time and installed. In the meantime, a series tungsten system of street lighting had been installed, and the original number of lights placed increased over 50 per cent, thus necessitating the installation of a larger transformer at the station for that service. To make room for the new unit and the switchboard, the old Chuse engine was removed, and the 100-kw. generator moved into another position and driven by the ice engine for light loads at all time thereafter. Following this installation of improved equipment came the installation of more boiler capacity, the construction of reinforced concrete steam and ammonia condenser towers, and the placing of motor-driven centrifugal pumps for circulating the cooling water over the condenser, and water cooling towers.

It was presumed by the owners that the 200-kw. unit when installed would furnish all current that would be required for a long time to come, as its capacity was about 40 per cent in excess of the peak load on the station, but within three years it was running an appreciable part of the time at from 10 per cent to 25 per cent overload, and it obviously became necessary to consider additional equipment. The writer suggested for consideration an oil engine installation, and was asked to present comparative figures pertaining to fixed costs and operating expense of oil engine, compound-condensing engine, and steam turbine-driven units. After an inspection of the factories of Diesel-type engine builders in various parts of the country, it was finally decided to install the Allis-Chalmers 500-hp., crude-oil engine, direct-connected unit shown in Fig. 3. This machine is a duplex twin engine, and for this section presents an economical unit possessing the advantage of permitting operation with two cylinders for light loads.

The foregoing discussion refers briefly to difficulties encountered by a utility in such piecemeal changes and how good management has met and overcome them. It is given chiefly to illustrate one important fact, namely, that the rehabilitation of an unfortunate and possibly unprofitable small utility and the placing of same in the rank with the successful, viewed from the standpoint of financial returns upon the value of the property, does not necessarily require the expenditure of a relatively large amount of money at the outset.

SERVICE NOW FURNISHED

In this town the electric lines have been extended and miles of new water mains laid; meters have been installed to conserve the former great waste of water, etc., otherwise additional plant equipment would not have been required within this relatively short period. Moreover, the town of Cameron has never had a "boom" in any way. It has had a reasonably normal, healthy growth and, therefore, the public utility located there can scarcely be said to owe its success and good standing with the people to any other influence than that of its own managerial efforts.

At the present time the population of Cameron is about 5000, and the utility furnishes the public with the conveniences and benefits of good water, adequate fire protection, lighted streets, all-day service of electric light and power, electric signs, picture shows, and electric fans, irons, and other utensils.

The consumers of electricity in this town at present number 425, and the consumers of water number 600, which is quite equal to what might be expected in towns of this size.

The people of this town have assisted in the development of this utility, and indirectly in the advancement of their own interests. Moreover, their interest in and appreciation of home enterprise was clearly demonstrated on one occasion when they stood by the utility in the face of a relatively powerful competitor.

As already mentioned, the Cameron utility, from its combination plant, furnishes electric power, water, ice and cold storage in the community. The ice-making equipment should have full credit for its part in the success of the combination, as a considerable amount of ice is shipped to other towns in the vicinity, and it also furnishes refrigeration for cold storage purposes. Moreover, the fact is strongly emphasized that for the smaller towns especially, a utility operating such a combination as referred to should meet with financial success quite beyond that which may be expected of a utility that supplies but one type of public service.

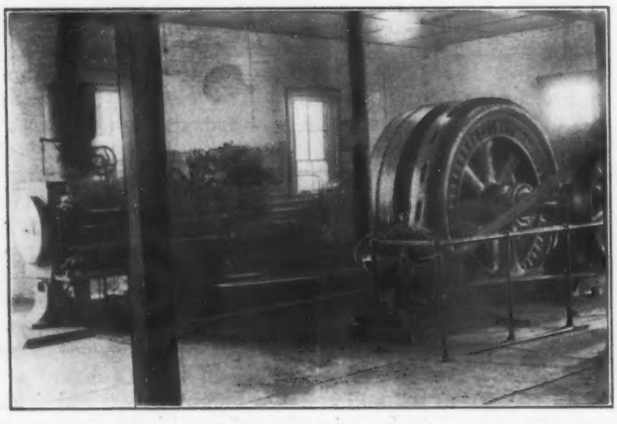


FIG. 2—FOUR-VALVE TANDEM-COMPOUND STEAM ENGINE DRIVING A 200-KW. UNIT WHICH WAS INSTALLED IN THE CAMERON STATION IN 1911

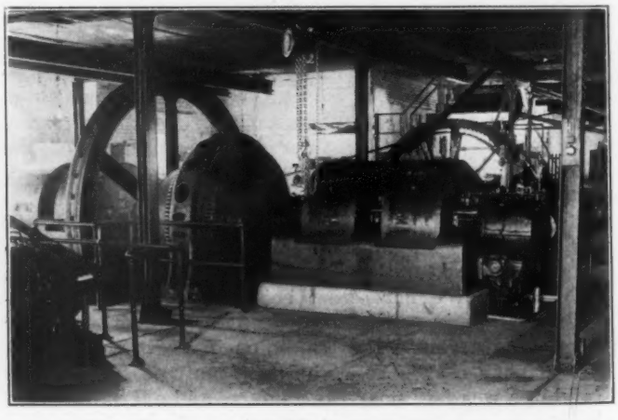
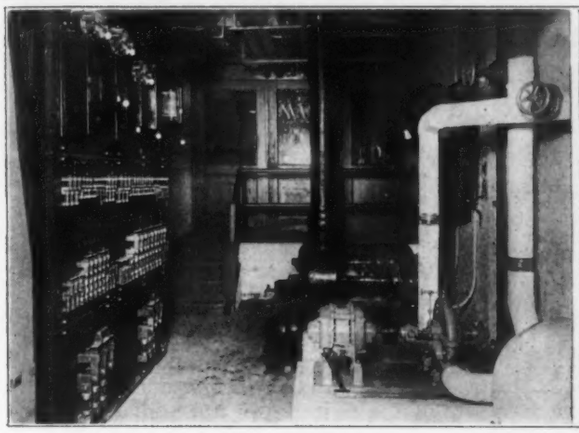


FIG. 3—CAMERON (TEX.) STATION, SHOWING 500-HP. DUPLEX CRUDE OIL ENGINE DRIVING MAIN GENERATOR; ICE MACHINE APPEARS IN THE REAR

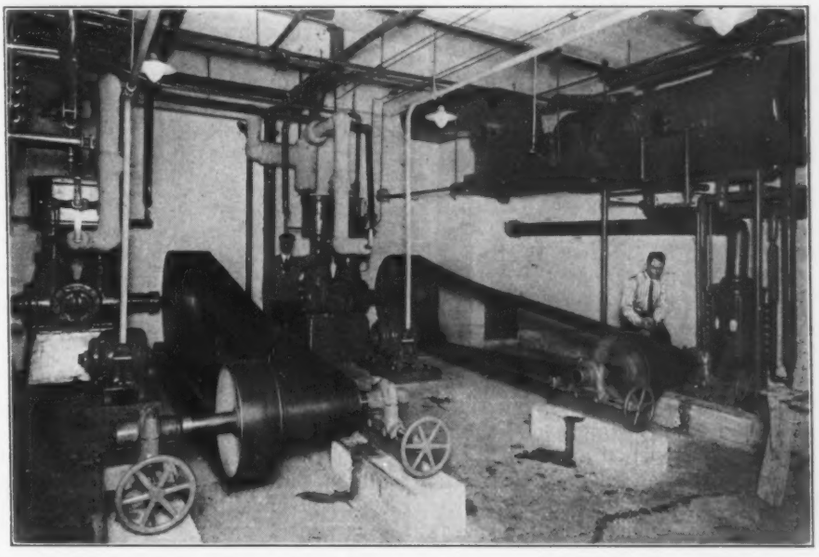
Electricity and Electric Refrigeration in a Modern Public Market



MAIN SWITCHBOARD, BRINE AND WATER PUMPS

HOISTING A 50-LB. CAKE OF ICE FROM THE FREEZING TANK

In the new Ninety-fifth Street Market on Broadway, New York City, electricity, aside from many interesting lighting applications, performs manifold services of refrigeration, cold storage, ice-making, ventilation, water pumping, and even the delivery of customers' orders by elevators to the wagon level below the main market room. Two 16-ton refrigerating machines, each driven by a 30-hp. alternating-current motor, furnish refrigeration for the 5-ton ice-freezing tank, the ice storage rooms, the meat storage chamber (temperature 35 deg. Fahr.), the freezing room (temperature 15 deg. Fahr.) and the concessionaires' twenty-two separate cold boxes and 130 lineal feet of chilled showcases. A 5-hp. motor-driven pump circulates the cooling water in the roof-top condenser system, and a 0.5-hp. motor-driven blower fan provides for freeing the compressor room of any possible ammonia fumes. E. N. Friedmann was engineer for the installation, and electric service is supplied by the United Electric Light & Power Company.



AMMONIA COMPRESSORS DRIVEN BY 30-HP. MOTORS WITH AUTOMATIC CONTROL

MAIN FLOOR OF THE NINETY-FIFTH STREET MARKET, SHOWING CONCESSIONAIRES' COLD BOXES AND REFRIGERATED SHOW CASES

Pulling Together for More Business

How the Electrical Interests of Cincinnati—Central Station, Jobbers, Contractors and Dealers —Have Harmonized Their Individual Interests to Meet the Buying Public on Common Ground

To make co-operation grow where disunion thrived has been the task of a committee of electrical men in Cincinnati. This city had the reputation three years ago of being under-developed electrically and of being also the center of a deep-rooted antagonism between the local dealers and contractors and the central station company. In fact, the situation was so discouraging that it was a matter of wide comment.

The new management of the Union Gas & Electric Company found that one of its tasks was to overcome, if possible, a long heritage of ill-feeling against the central station company on the part of the dealers and contractors and also of the feeling in the utility organization that the dealers and contractors had failed to do their part to build up business.

Not only was there a complete lack of co-operation in the early part of 1915, but the bitterness and criticism of the dealers and contractors was expressed in many ways. Leading dealers and contractors did not know the principal officials of the Union Gas & Electric Company. Trade and other matters of common interest were never considered in conference. Although a rate controversy affecting the central station company was pending, the electrical men of the city were not acting together in the interest of all.

The responsible officials of the large company felt that they carried the responsibility of developing the city electrically, and that they were receiving nothing but hostility from the dealers and contractors who were bound to benefit from all progress. The dealers and contractors maintained that the central station company had made it impossible for them to do business at a profit, had opened an electric shop to take away their business and had tried, in effect, to drive them out.

Through the electric shop the central station had inaugurated cut-price sales and bargain days which came as unpleasant surprises for the unprepared dealers and contractors. A number of these sales had taken place, and each one increased the feeling of ill-will left by its predecessors. The climax, so far as the dealers and contractors were concerned, developed last summer with a cut-price sale of fans. This the central station company declared was necessary in order that an overstock of fans, partly of obsolete patterns, might be sold. But it increased the antagonism that had been created.

The Committee in Charge

Into this situation there came the Electrical Prosperity Week movement. A committee composed of local Cincinnati men was appointed by the Society for Electrical Development.

The members of this committee are as follows: James A. Brett, Westinghouse Electric & Manufacturing Company; C. M. Crofoot, Crouse-Hinds Company; Walter Draper, vice-president, Cincinnati Traction Company; H. S. Gilhams, Jr., Westinghouse Electric & Manufacturing Company; W. J. Hanley, manager, General Electric Company; W. W. Freeman, chairman; L. T. Milnor, vice-chairman and treasurer of committee, Western Electric Company; H. J. Hoover, commercial manager, Union Gas & Electric Company; C. E. Ogden, Walker Vehicle Company; W. G. Reuter, Reuter Electric Company; Thomas J. Ryan, General Electric Company; T. F. Wickham, secretary and treasurer, Union Gas & Electric Company; H. Serkowich, secretary of committee, Chamber of Commerce; W. K. Shockley, manager; James C. Hobart, Triumph Electric Company. But for some time no effort was made to secure any action looking to a celebration of the Electrical Week. When action did begin it was started from several directions. One of the most important of these was the activity of the Chamber of Commerce of Cincinnati. This is an organization of unusual enterprise and public spirit. It was led to try to promote good feeling among the different elements of the industry by its desire to obtain better lighting. As a matter of civic importance it is working to interest the city in a proposition to introduce more ornamental lighting standards into the central business district.

Some of the jobbers and dealers and contractors, who learned what other cities were making in the way of plans for Electrical Week, began to ask what Cincinnati could accomplish. W. W. Freeman, president of the Union Gas & Electric Company, who had been appointed chairman of the committee, asked the members to meet at lunch with other local dealers and contractors. At that meeting he said that he wanted to co-operate with the dealers and contractors, and that thorough co-operation would be needed to make the movement a success. Then he withdrew and the dealers and contractors discussed the conditions among themselves. Could they expect the central station to give a co-operation which would benefit all? Would the dealers and contractors see any results from co-operation? Could they meet the central station in co-operative plans for a celebration and be confident of any returns that would help their business?

Decision to Co-operate

Fortunately the dealers and contractors, after their discussion, were responsive to the policies expressed by Mr. Freeman. And having decided to co-operate they did so unreservedly. The Cincinnati electric show, held during the week of the celebration, was the greatest electrical display and advertisement in the history of the city. Although the decision to have the show was made only five weeks before the date fixed for Electrical Prosperity Week, the results went far beyond all expectations. All of the different electrical interests combined their efforts to make it a success.

Some of the incidents in connection with the plans for the electrical show are interesting. The original committee was composed of only five members, and in view of the enlargement of the celebration plans and the increasing amount of interest which developed rapidly among the electrical men in the city it was decided to appoint ten additional members. The first plan was to spend $6,000 on the show, of which the central station company agreed to furnish one-half. This was found later to be insufficient, and then a corporation was formed to conduct the enterprise with a capital of $10,000. Three weeks before the celebration date a manager was employed. He had been the manager of a successful automobile show, but was inclined to be incredulous at the statements of the electrical men that they proposed to do better than the automobile show. The members of the committee started to have dinner together each day, but found that their time disap-

peared in the process, and so they substituted instead daily meetings. In selling the exhibit space Mr. Freeman and leading representatives of the manufacturers and jobbers worked hard. They used automobiles and put in five or six hours a day. "We pulled every string and got wonderful co-operation," said one of the committee members. The result is seen in the statement that the show company finally spent $25,000, and had a net profit of $4,600. For a city of slow electrical development this is remarkable.

The point about the situation which is of the greatest importance for the future is, of course, the fact that it was an object lesson in co-operation, the most striking one that could be presented. The central station company, as was necessary, took the leading part. Local representatives of manufacturers and the jobbers followed. But the dealers and contractors were, at first, frankly skeptical. They felt hurt, and were sure that their business had been damaged by the operations of the central station company in the earlier years. Their doubts extended not only to the relations with the central station company, but also to their relations with each other. Unaccustomed, as they were, to working with the central station company, they were equally unaccustomed to working with each other.

A Dealers' Organization

But when these men saw the undoubted results of co-operation in the Electrical Prosperity Week movement they concluded that their future course should be different. And one of the results of the show was a dealers' organization with nine members enrolled at the beginning.

There are other tangible results. The show company remains in existence. Every exhibitor at the 1915 show received for each $100 space ten shares of $10 par value, and a cash rebate of $22.50. The company still has in the treasury over $2,000, after having contributed a Christmas tree for the Cincinnati community celebration. And even as early as the present time general plans for features for another electrical show are being considered tentatively by individual members of the committee. It is figured that Cincinnati will have enough electrical enthusiasm for at least one more large show.

Another result is the continuation of the committee. Already it has been called together to consider several matters which are of common interest to the various branches of the industry. It was reconstituted as the committee to handle the house-wiring campaign and did excellent work in that direction.

Co-operative Advertising

One of the principal places to look for real evidences of a new spirit of co-operation is, of course, in the existing relations between the electric shop of the central station company and the dealers and contractors. Here there are undoubted signs of a new common purpose. One of the most interesting of these is co-operative special sales. In such cases the electric shop acts as the purchasing agent for the dealers and contractors who are working with it. By uniting the orders the benefit of a quantity price is obtained, and since costs of purchase are the same the price can be the same for each dealer and contractor and for the electric shop. The method of advertising these sales is co-operative. Names of the participating dealers and contractors appear in equal prominence with that of the electric shop. The readers of the advertisement and the buyer know that the same qualities and terms can be obtained from any of the joint advertisers. This plan has been conducted successfully with toasters and electric heaters for automobiles, although the toasters proved to be the more popular. The electric shop also continues to give special sales at cut prices, but it does not do so without the knowledge of the dealers and contractors, so that if they want to offer similar advantages they can do so. In other words, the effort is to co-operate in special public offerings if the dealers and contractors so desire.

Wiring Old Houses

In another way—the wiring of old houses—the central station company is working with some of the dealers and contractors. The company has been conducting a campaign for the wiring of old houses, and the results have been substantial. The rapid advance in the cost of copper and increases in the costs of other materials made the first wiring rates so unprofitable to dealers and contractors that the central station company revised them. Even now, it is asserted by some of the dealers and contractors, the wiring of old houses cannot be done profitably at the prices fixed by the central station company. In quarters where this feeling exists the belief still prevails that the company is not co-operating as fully as possible in the interest of the dealers and contractors.

In general, the opinion was expressed in Cincinnati that a far higher degree of co-operation has been developed than ever before existed in the city. Certainly a great change in the basis of the relations is reported by various prominent dealers and contractors. Those who like the new administration and do not hesitate to express their warm approval of its policies call attention to the advertising, the friendship which now exists with the officials of the company and the growing interest of residents of the city in the use of electricity. They feel that these influences will react in turn on their own business.

One of the interesting developments in connection with the work of co-operation is the permanent interest of the Chamber of Commerce. This organization showed its interest at the outset by providing office facilities for the preparatory work in connection with the show and by attending to the necessary correspondence, etc. H. Serkowich, who is the head of one of its departments, acted as the secretary of the committee. The assistance of the Chamber of Commerce was given freely on the ground that it would promote a better trade feeling in the electrical industry, and that there would be an ultimate reaction on the plan for a finer ornamental lighting system in the city.

Overcrowding Under-Development, Says Mr. Freeman

Mr. Freeman, when asked to discuss the situation, said:

"We have tried to develop in the different branches of the industry a genuine desire for team work. In team work the pulling power of each one has to be exerted if the full power of the combination is to be secured. If one in the team does not do his part his share of the load is borne by another. What we want to feel is that all interests are pulling together in the same direction for the same aim. Only this policy will yield the results that we need.

"Just because Cincinnati has been under-developed electrically in the past it is necessary to make extra efforts to promote the interest of the people in our products. Financial benefits will follow such efforts, and they will be realized in part by every electrical interest in the city. The problem is to enlarge the circle of co-operation so that it shall include all of the electrical interests. For we have done so much that we want to do still more and have a unanimous sentiment for co-operation in Cincinnati."

Reforms in Practice of Commission Regulation

Dr. Alexander C. Humphreys, President of Stevens Institute, Points Out That Company Initiative Should Not Be Destroyed, Nor Should Commissions Exercise All Three Functions of Government

The necessity of many reforms in the practice of commission regulation was emphasized by President Alexander C. Humphreys of Stevens Institute of Technology at a joint meeting of the Boston Society of Civil Engineers, the Boston branch of the A. I. E. E. and other engineers in Boston, Mass., April 21. Speaking from the standpoint of one who has filled the chair of expert witness in a large number of commission cases, Dr. Humphreys declared that public utilities are suffering in many States from over-regulation, and he severely criticised the methods of procedure in a number of instances where in his opinion a fair presentation of the case was not conducted by the investigating tribunal.

DR. A. C. HUMPHREYS

Dr. Humphreys pointed out that while, on the one hand, quasi-public corporations should be required to submit to regulation under governmental authority, on the other hand this regulation should not be so overdeveloped as to deprive the officers of these corporations of the opportunities to employ completely their initiative in the interests of both the investors and the public served. To obtain the best results for all concerned, co-operation between the various interests is a prime necessity. It is not improbable that the country has suffered as much from the ill-directed zeal of honest but self-sufficient enthusiasts as from the cunningly directed activities of the reformers for personal profit. The speaker emphasized the tendency toward excessive legislation in recent years and condemned the practice of many chairmen of legislative committees in preventing the development of a complete record during their inquiries of witnesses. Vigorous criticism of the biased "investigations" of the Federal Industrial Commission was advanced.

LIMITING CONDITIONS TO REGULATION

The speaker held that there are two fundamental conditions that should limit public utility regulation: First, the initiative of the public service corporations should not be destroyed, and, second, the commissions should not be allowed to exercise all three functions of government—legislative, executive and judicial. Under commission control, over-regulation and unnecessary interference with individual enterprise have been gaining headway year by year. The regulation of business in many cases has developed, or, more correctly, degenerated into persecution, and this applies to business other than that of public utilities. The tendency of both federal and States commissions is to get deeper and deeper into the details of management, to become more and more active in legislation and the framing of major and even minor rules, and to be more and more keen to sit as judges in trials of public service corporations. The commissions more and more concern themselves with and exercise their authority with respect to the details of design, construction, production, management, administration and financial policy. Thus they exercise the authority while avoiding responsibility for final results—a most inefficient and dangerous system.

In State commission hearings it is not infrequent for the presiding commissioner to examine witnesses in a way to indicate bias. "Witnesses are so examined as to cloud and confuse rather than to clarify the record," said Dr. Humphreys. "The commissioner presiding should so examine witnesses as to make clear that which has been left obscure. Especially in the case of stupid or timid witnesses, he should consider it a privilege to develop the truth, the whole truth and nothing but the truth. While these incompetent witnesses should be assisted, the tricky witness should be relentlessly cross-examined." Dr. Humphreys cited cases of abuse of powers by public service commissioners in examining witnesses, and said that "many cases which should be carried to the courts because of such abuses are not appealed for reasons of policy, timidity or general lack of backbone. By experience, I am convinced that the corporations have suffered material loss and loss of prestige by this cowardly course. Unless the corporations fight for their just due, they are charged with being found in the wrong. They should be very sure they are right and then fight to the limit. While, of course, I have been concerned in cases before commissions where hearings were conducted fairly and decently, I am obliged to say that these cases have not, in my personal experience, been in the majority."

Dr. Humphreys said that he believed many of the minor troubles and injustices could be eliminated from commission control if thoroughly qualified engineers were put on the boards. Every commission should have at least one duly qualified engineer as a member. Closing, he urged that in a democracy the citizens must be prepared to pay a price for the liberties enjoyed under such a form of government. The people as a whole, through their representatives, should direct only as to principles and larger policies; the individuals should be left free to work out their own salvation with respect to things less essential. A privately owned and conducted enterprise could not live if it had to carry the burdens of political favoritism and interference which so seriously hamper the progress and development of government owned enterprises.

DISCUSSION

Prof. Dugald C. Jackson of the Massachusetts Institute of Technology said that commission regulation and judicial procedure are still young in many States, and that improved practice is to be expected with experience. He emphasized the importance of interesting a larger public in utility affairs, notably through the issue of small-denomination bonds, such illustrating a kind of "government ownership" favorable to the country and the corporations alike. Professor Jackson urged engineers to study the cost of their own work more carefully, and pointed out the importance of understanding

the broader costs and relations of such work to undertakings in which it is required.

Chairman Alonzo R. Weed of the Massachusetts Gas & Electric Light Commission stated that monopoly is commonly attended with certain evils, and that regulation is simply a check upon monopoly. There has been a tendency to over-develop regulation, but the public service corporations have it largely in their control as to the kind of regulation which shall be imposed. "When the companies become so virtuous that they shine," the speaker said, "regulation will pass away." Mr. Weed was of the opinion that many other questions than those of engineering enter into regulative work, and without minimizing the importance of technical problems, felt that the necessity for regulation as a counterpoise to monopoly rests upon a very human base.

Frederick P. Stearns, consulting engineer, Boston, said that, in his opinion, as a rule commissioners intend to be fair. He discussed the need of more rational theories in valuation, pointing out the discrepancies arising from different lines of attack.

Large Increase in Central Station Business

February, 1916, Light and Power Earnings $4,550,000 Greater Than in February, 1915—Output Increase of 395,000,000 Kw.-hr.

RESULTS of operations in the light and power industry for February, 1916, according to the returns received by the ELECTRICAL WORLD from 64 per cent of the industry, in comparison with similar months of previous years were decidedly better than any previously obtained. Increases over February, 1915, amounted to 15.7 per cent in gross earnings from the sale of energy and 29.9 per cent in the kilowatt-hour output.

Gross earnings for the entire industry amounted for the month of February last to $34,250,000, an increase of $4,550,000 over February, 1915, earnings. The output for the second month of this year was 1,730,000,000 kw.-hr., which is an increase of 395,000,000 kw.-hr. over the corresponding month of last year. The totals for February, of course, are not as large as for either January or December. Nevertheless, the percentages of increase over last year were so great that the increase in earnings in February last over the previous February was of the same magnitude as for January and more than $500,000 greater than that for December, while the February increase in the output was the greatest on record up to that time.

Better increases were felt all along the line. New England jumped from an increase of 15.1 per cent in earnings for January to an increase of 19 per cent in February, and in output from 26.5 per cent to 35.3 per

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1915	1914	Per Cent Increase	1915	1914	Per Cent Increase
March	64	$18,654,443	$17,529,054	6.4	939,117,179	896,903,968	4.8
April	65	18,406,412	17,675,784	4.2	900,536,022	859,235,144	4.8
May	65	17,644,205	16,764,546	5.3	920,895,324	842,386,583	9.3
June	65	17,603,614	16,476,255	6.9	925,067,308	836,292,076	10.6
July	64	18,488,793	17,200,827	7.5	971,699,054	880,768,487	10.4
August	64	17,342,796	16,024,893	8.2	951,752,053	853,381,696	11.3
Sept	65	18,547,170	17,074,927	8.6	1,003,606,094	871,573,412	15.1
Oct	65	20,112,813	18,329,490	9.8	1,087,786,658	949,288,459	14.7
Nov	65	21,899,048	19,720,232	11.6	1,150,669,073	948,704,941	21.3
Dec	64	23,418,774	20,962,264	11.8	1,230,655,404	1,004,108,399	22.5
		1916	1915		1916	1915	
Jan	64	25,232,240	22,302,309	13.2	1,197,747,832	981,653,314	22.0
Feb	64	21,937,290	18,982,517	15.7	1,108,307,590	854,714,747	29.9

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	New England States			Atlantic States			Central States (Illinois Excluded)			Pacific and Mountain States		
		Percentage of Industry Represented	1915	1914	Per Cent Increase	Percentage of Industry Represented	1915	1914	Per Cent Increase	Percentage of Industry Represented	1915	1914	Per Cent Increase	Percentage of Industry Represented	1915	1914	Per Cent Increase
INCOME	March	67	$2,146,032	$1,999,326	7.5	69	$7,777,126	$7,419,808	5.2	55	4,885,384	$4,465,728	9.5	88	$3,605,893	$3,412,842	5.8
	April	67	2,109,767	1,976,473	6.8	69	7,510,810	7,241,164	3.9	57	5,003,673	4,773,949	4.8	88	3,475,740	3,366,830	3.2
	May	67	2,035,680	1,887,606	7.9	69	7,100,334	6,912,581	2.6	57	4,946,907	4,577,818	8.1	88	3,383,749	3,233,989	4.8
	June	67	2,063,423	1,874,575	10.2	69	6,945,986	6,628,523	4.8	57	4,993,410	4,492,411	11.2	88	3,409,738	3,281,696	3.9
	July	66	2,020,513	1,835,968	10.2	68	6,710,217	6,519,442	2.9	56	4,801,699	4,211,641	13.9	88	3,539,168	3,317,713	6.8
	August	63	2,057,635	1,855,140	11.0	68	6,853,118	6,511,307	5.3	56	4,749,082	4,231,322	12.2	88	3,545,454	3,288,729	7.8
	September	66	2,162,064	1,949,663	11.0	68	7,288,842	6,904,245	5.5	57	5,285,358	4,691,751	12.6	88	3,664,215	3,387,717	8.2
	October	66	2,327,214	2,073,059	12.3	68	8,096,982	7,550,808	7.2	57	5,820,653	5,153,314	13.0	88	3,798,012	3,477,051	9.3
	November	66	2,472,539	2,188,049	13.0	67	8,894,805	8,158,589	9.0	57	6,342,582	5,554,226	14.2	88	4,069,995	3,703,124	10.0
	December	66	2,817,557	2,448,813	15.0	67	9,335,396	8,529,866	9.4	57	6,983,909	6,063,349	15.1	88	4,150,045	3,773,810	10.0
			1916	1915			1916	1915			1916	1915			1916	1915	
	Jan	65	2,765,048	2,381,765	15.1	67	9,589,347	8,564,488	12.0	57	7,834,831	6,717,799	16.6	88	4,182,114	3,823,156	9.4
	February	65	2,538,213	2,132,659	19.0	67	8,978,797	7,854,345	14.3	57	6,651,166	5,559,951	19.7	85	3,644,793	3,321,282	9.7
KW.-HR. OUTPUT	March	67	72,121,319	65,343,335	10.5	69	346,341,496	335,506,429	3.3	55	257,136,231	235,656,647	9.2	88	255,529,704	253,423,951	1.0
	April	67	68,475,232	62,442,110	9.7	69	320,142,323	311,476,008	3.0	57	257,967,434	237,673,326	8.5	88	246,287,781	239,661,364	2.8
	May	67	68,823,914	61,060,621	12.9	69	326,191,569	301,440,779	8.1	57	262,885,043	236,154,464	11.2	88	254,586,394	236,082,868	7.8
	June	67	71,566,127	60,972,379	17.4	69	318,245,370	293,751,083	8.5	57	265,930,311	234,286,440	13.2	88	261,083,835	237,843,021	9.8
	July	66	71,025,184	60,755,381	17.0	68	320,371,761	293,909,832	9.0	56	264,498,989	232,541,585	13.9	88	274,488,334	258,475,004	6.3
	August	63	71,954,506	60,870,433	18.5	68	329,947,721	302,960,234	8.9	56	272,508,518	240,423,753	13.4	88	276,631,551	248,463,980	11.3
	September	66	74,835,203	63,716,224	17.3	68	358,765,971	319,549,780	12.3	57	286,893,057	247,046,941	16.1	88	279,133,989	237,795,633	17.5
	October	66	82,568,951	69,882,867	18.3	68	400,516,741	353,685,472	13.3	57	305,962,017	268,972,416	13.7	88	292,885,623	251,095,356	16.8
	November	66	87,193,883	69,359,620	25.8	67	420,584,253	355,151,259	18.5	57	333,528,905	269,870,536	23.7	88	301,772,412	248,913,893	21.0
	December	66	99,744,195	80,446,521	24.1	67	447,158,465	373,213,316	20.0	57	363,859,444	293,266,707	24.1	88	311,034,100	249,996,678	24.5
			1916	1915			1916	1915			1916	1915			1916	1915	
	January	65	94,148,174	74,477,605	26.5	67	431,201,554	356,809,437	20.8	57	362,121,067	284,407,361	27.5	88	301,645,060	258,982,414	16.5
	February	65	89,785,578	66,286,778	35.3	67	411,715,612	320,924,478	28.1	57	339,096,030	252,643,311	34.1	85	259,289,089	209,082,471	24.0

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	4.8	6.5	5.3	7.2	7.3	8.7	9.8	10.2	10.7	14.0
Group 2	6.2	2.8	8.8	9.1	10.0	11.4	12.8	13.8	21.3	20.0
Group 3	5.8	10.1	9.7	14.5	15.4	23.4	18.0	19.8	18.3	20.7
Group 4	7.1	6.9	8.2	8.0	9.0	8.7	11.9	13.6	10.6	16.8
Group 5	5.5	4.7	8.5	7.5	11.9	5.7	13.0	13.0	7.2	18.5
OUTPUT:										
Group 1	7.2	10.1	11.1	9.7	12.2	10.7	17.0	19.0	19.0	26.2
Group 2	13.1	9.1	18.1	19.0	18.9	21.4	29.0	31.5	28.0	40.6
Group 3	6.1	11.2	4.5	13.0	24.0	27.3	36.0	33.0	33.2	39.6
Group 4	29.1	6.0	12.5	10.9	11.3	13.4	18.0	16.3	18.8	24.2
Group 5	15.5	14.8	20.5	12.7	19.3	1.7	13.4	9.7	8.5	22.4

*Decrease

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	9.4	11.6	11.2	11.0	10.6	12.7	13.8	14.8	16.5	18.0
Group 2	7.5	7.0	7.0	9.6	10.3	12.6	12.7	16.1	15.4	19.9
Group 3	8.9	21.8	10.2	16.5	14.7	17.3	15.5	22.8	22.1	29.7
Group 4	7.1	11.9	6.6	9.2	10.0	8.8	9.0	9.6	12.1	15.0
Group 5	1.0*	2.8	16.0	21.2	5.8	8.3	13.7	23.5	20.6	26.3
OUTPUT:										
Group 1	16.0	19.0	17.2	17.2	19.2	20.8	28.7	26.2	29.0	38.5
Group 2	19.9	20.8	26.0	26.0	21.7	18.3	30.0	26.5	26.0	36.8
Group 3	7.0	17.9	13.5	12.3	14.4	8.7	23.0	22.5	39.5	41.6
Group 4	6.3	17.1	7.8	13.6	9.0	20.6	20.1	18.5	15.1	25.4
Group 5	13.5*	1.0	11.0	15.1	8.5	1.8	51.0	14.5	22.6	25.6

*Decrease

cent. The Atlantic States showed a growth in the percentage increase in earnings from 12 per cent in January to 14.3 per cent in February, and in income from 20.8 per cent to 28.1 per cent. Similarly in the Central States there were appreciable gains in the percentage of increase.

The February earnings increase was 19.7 per cent, while that for January was 16.6 per cent; the February output increase was 34.1 per cent, and that for January was 27.5 per cent. In the Pacific and Mountain States the January earnings increase was 9.4 per cent and for February it was 9.7 per cent, while the January output increase was 16.5 per cent and for February 24 per

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	2.0	3.8	1.4	4.0	4.4	6.2	7.6	8.3	11.1	13.7
Group 2	8.2	8.0	9.7	11.6	11.0	11.9	15.0	14.0	18.2	18.4
Group 3	1.6	7.5	7.5	8.5	8.9	11.0	10.0	13.1	11.9	14.6
Group 4	6.2	3.9	7.0	8.4	10.0	9.8	14.4	15.3	17.4	19.4
Group 5	19.6	14.8	†	2.0*	14.3	10.9	14.6	12.2	16.0	15.8
OUTPUT:										
Group 1	9.0	8.2	8.0	9.0	11.6	12.1	16.0	20.1	21.1	30.8
Group 2	7.1	11.0	17.0	15.0	16.3	16.8	26.6	25.5	26.4	33.4
Group 3	3.2	7.2	7.5	6.4	10.4	15.8	22.1	16.6	20.1	22.0
Group 4	22.5	7.1	13.8	13.2	12.5	14.8	22.0	18.9	15.6	21.8
Group 5	71.5	61.8	†	11.4	13.8	2.8*	18.6	20.6	1.5	24.0

*Decrease. †Results omitted owing to insufficient returns.

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KLOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

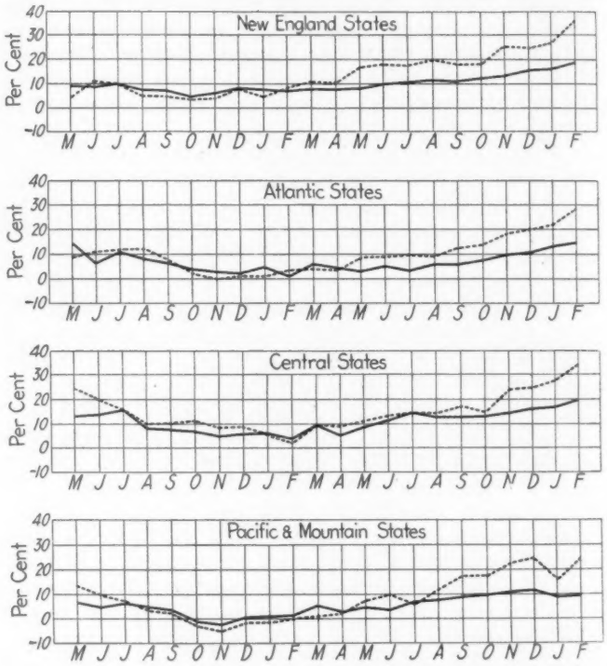
	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	9.8	11.4	11.8	12.2	12.4	12.3	17.0	15.8	14.3	18.3
Group 2	3.0	5.6	7.0	7.5	8.6	10.2	10.8	9.8	25.5	20.5
Group 3	15.5	19.6	16.4	21.0	22.0	22.7	24.0	25.1	24.3	27.0
Group 4	6.7	12.4	13.0	16.9	17.9	16.0	19.8	18.3	9.6	21.6
Group 5	19.9	5.0	1.2	20.2	13.5	24.7	9.6	18.0	5.7	11.1
OUTPUT:										
Group 1	8.4	10.8	11.8	12.2	15.2	10.4	22.0	21.9	24.9	30.3
Group 2	9.7	13.5	11.1	9.8	9.0	14.0	21.5	31.0	28.8	44.0
Group 3	27.0	26.1	28.9	31.0	29.3	34.2	43.0	41.2	32.5	44.0
Group 4	10.0	15.7	18.2	26.1	29.0	33.5	36.7	18.5	53.4	41.7
Group 5	28.8	20.4	24.9	25.1	48.0	3.0	17.3	20.6	13.3	15.9

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	3.1	9.0	5.1	7.0	13.9	7.5	7.5	6.0	11.6	6.7
Group 2	12.7	11.1	13.0	11.1	11.5	14.3	15.7	17.3	†	†
Group 3	3.4	3.6	7.9	17.1	19.7	21.4	20.0	24.6	19.7	22.0
Group 4	8.7	1.6*	7.8	0.2	0.3	0.1	4.3	10.8	3.0	8.4
Group 5	2.4*	3.3	4.5	1.7*	15.0	3.1	13.5	3.9	10.5	17.8
OUTPUT:										
Group 1	2.3	10.8	6.2	6.3	8.4	7.1	9.9	13.1	9.1	13.0
Group 2	19.0	14.9	27.5	39.3	40.3	41.3	51.0	56.0	†	†
Group 3	3.8	12.4	8.4*	18.5	49.2	52.4	67.0	67.0	56.0	68.8
Group 4	87.0	4.5*	11.8	0.2	4.1	1.5	6.2	10.5	1.8	13.5
Group 5	18.5	3.6	10.9	8.0	21.0	3.5	8.3	1.0	1.0	20.1

*Decrease. †Results omitted owing to insufficient returns.

cent. Gratifying, though, as such figures are, it must not be forgotten that 1916 is leap year and that February, 1916, therefore contains one more day than February, 1915. One extra day makes a material difference. However, whether it would bring the February percentage of increase down on a par with those for December and January is not known. It is known, though, that, industrially speaking, February was the busiest



FIGS. 1 TO 4—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT—SECTIONALLY

month, taking the country as a whole, that the United States has ever known.

As an indication labor was scarcer in February than it has been for years, and the railroads up to that time probably never saw such a demand for rolling stock.

Machinery and steel mills were working to capacity, as were those shops working on munitions of war. Mining activity was as great as it could be.

In all of this prosperity electricity was in evidence. The increase in electric drive and industrial heating in preparation for this great rush of business has been

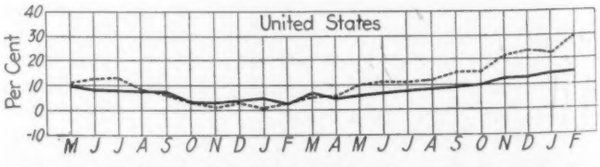


FIG. 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT—UNITED STATES

simply astounding. Reports of new loads of thousands of horsepower are no longer rare. Manufacturers of electric motors are not able to deliver motors as fast as orders come in, and they have orders now that will keep them busy for many months.

Industrial electric heating has increased to the point where America now leads the world in number of electric furnaces for steel reduction, and several of the more prominent automobile manufacturers during the past year have tried out electric heating for enameling. These installations have proved so satisfactory that electric ovens are finding a much wider use for this work. A further new use of electric energy on a large scale, the effect of which is apparent in the February, 1916, figures, is that for the Chicago, Milwaukee & St. Paul Railway, which was recently electrified.

The accompanying curves show graphically the percentages of increase given in Tables I and II. In the remaining tables are given the percentage of increase, both in earnings and output, for companies grouped according to the size of the communities in which they operate. Group 1 contains those companies operating in cities whose population is over 100,000 inhabitants; group 2 in cities whose population is between 50,000 and 100,000; group 3, between 25,000 and 50,000; group 4, between 10,000 and 25,000, and group 5, between 5000 and 10,000.

The High Cost of Serving the Farm Customer

Relatively Great Investment and Large Operating and Maintenance Expenses Per Rural User of Central Station Service—These Costs Must Be Offset by More Revenue Per Customer if Unit Net Revenue Comparable with That for Town Service Is to Be Obtained

Although the farm customer will eventually provide good paying business for the central station, such rural service can hardly be considered entirely profitable under present conditions, according to P. H. Palmer, assistant general manager of the Indiana Railways & Light Company, Kokomo, Ind.

Referring to conditions in the territory served by his own company, Mr. Palmer said, in a paper presented before the new-business men of the Indiana Electric Light Association, April 19, that the cost of one such strictly rural line 13.11 miles long was, with transformers and service wires, $340 per mile. The average number of customers per mile on this line is 3.97, making an average line investment per customer of $85.64. Adding 15 per cent for superintendence and intangible costs brings the investment per customer to $98.49. In residence districts in towns, the average corresponding investment in lines, transformers and service wires has been found to be about $48 per customer, including 25 per cent to cover superintendence and intangible costs. The investment for the rural customer is, therefore, nearly twice that for the urban residence customer.

Assuming that capital cannot be obtained for farm-line projects for less than 8 per cent interest, and that depreciation of the line amounts to 2 per cent, the annual cost for these two items is $5.50 per mile per customer. Pole renewals are not included in the above depreciation charge, since the Public Service Commission of Indiana classifies the renewal of poles and fixtures as maintenance cost. It may be pointed out, however, that the annual cost per customer for maintenance, including pole renewals, is approximately $3 per year, on account of the greater length of lines necessary to reach the more remote locations. For the latter reason, also, the cost of meter reading and meter testing is about 50 cents per customer per year greater in the country, despite the fact that meters are read only every three months.

To Serve Rural Customer Costs $8.65 per Year More Than Town User

Two 1-kw. transformers are required on the average for every three rural customers. For this reason the core loss in the rural-line transformers at the average central station cost amounts to approximately 60 cents more per customer per year for rural consumers than for urban customers. This brings the total cost of serving a rural customer to $8.65 per year over and above that of supplying the town customer with the same class of service.

Assuming an arbitrary figure of 40 per cent of operating revenue as the cost of operation, it would be necessary to increase the business of rural customers $14.42 per year per consumer, as compared with the urban customer, if the same net revenue per customer is expected for both classes of business. According to the records of the Indiana Railways & Light Company—Mr. Palmer's organization—the average annual receipts per urban-residence customer were $18.40 for the year 1915, while the receipts per farm customer were $18.30. The income from the latter should have been $32.82, pointed out the author, had the rural customer been on the same paying basis as the customer in town. In other words, the amount of sales to each rural customer should be increased by $14.50 per year in order that that class of business might pay a reasonable percentage on the investment.

It may be pointed out that the few miles of rural lines which are now operated by the Indiana company touch only its best territory, and should it undertake to cover its whole territory with service, entirely different figures would result. The investment per mile would be much greater, and some of the other costs would be proportionately larger. No attempt has been made to estimate what the cost would be in that case, but it is evident, declared Mr. Palmer, that extensions to communities paying less than those now served should not be considered at this time.

The few miles of strictly rural lines which the company now operates have been installed as an experiment, with the hope of developing a business that will pay not only in the case of the present country installation, but will provide means of learning how to turn much larger rural areas into paying districts and at the same time supply the farmers' wants.

Increasing Use of Service by Farm Customers

The problem of rapidly developing the rural business into a paying proposition looks rather difficult, according to Mr. Palmer. First, the farmer will have to pay more for the energy he receives than does the town customer. He will also have to guarantee a minimum in compliance with the figures given above. In order that he may willingly do this he must be won over to appreciation of the advantages of greater use of electricity.

As yet, it has been difficult to get a farmer to pay $60 per year to operate a 5-hp. motor for driving his feed grinder, yet the company does not feel that this charge can be reduced. There are hopes, however, that a 1-hp. or 2-hp. feed grinder may appear on the market to relieve this situation. A motor of one of these small sizes could serve also as a general utility motor—grinding feed, pumping water and serving for domestic uses.

By the foregoing expressions, Mr. Palmer was careful to state in closing, he does not mean to discourage rural service, since he believes, he said, that this field will eventually develop into a paying business, although opportunities in the line of farm supply lie in the future.

Bulk Supply of Electricity in England Proposed

Suggestions Made to Erect Huge Inter-Connected Power Stations for Dealing with the Electricity Supply of the Country as a Whole under Governmental Supervision

WITHOUT nationalization or municipalization of the electric systems of England the suggestion has been made that the supply of electricity and power should be vested in the hands of the government, that big power houses should be established at suitable centers all over the country, and that England should have a ministry of electricity. The scheme, which was fully set forth on April 13 before the British Institution of Electrical Engineers by Ernest T. Williams, does not propose to confiscate the rights, privileges and property of individuals or municipalities.

Since it has been economically sound to centralize generating units in larger power plants, there should be no hesitation, it was felt, about taking a step to replace eventually the large number of small, costly and comparatively inefficient plants by a few modern inter-connected plants which would furnish the entire country with energy. Lower capital cost per kilowatt-hour of output owing to cheap sites, reduced expenditure on buildings, large generating units, and decreased percentage of reserve plant, and lower working cost per kilowatt-hour due to higher load factor, higher plant factor, lower fuel cost, lower establishment and labor charges, and lower maintenance costs would be the resultant advantages of such a system.

Furthermore, the area of England is comparatively small. No country offers so great promise for a sound and economical energy supply if taken as a whole.

Control Concentrated in One Body

While at present the public control of the energy supply for light and power service throughout the country is vested directly in Parliament, in the Board of Trade, in the Local Government Board and in the Home Office, it is proposed that under the new scheme the control shall be co-ordinated by a central body directly responsible to Parliament. While this body shall not at all be a government department in the accepted sense of the word, it must nevertheless have all the weight of government authority and be able to authorize or raise large loans on government security at a low rate.

As proposed, the board will include six electrical engineers who will be responsible for the entire generation and distribution of electrical energy in their respective districts, one legal member responsible for all legal advice, arrangements, etc.; one accountant member responsible for all accounts under the board and for auditing the accounts of all offices in the eight districts; one financial member on whom will rest the responsibility for advising on the raising and repaying of loans and the work in connection therewith; and one parliamentary member who will be responsible for representing the board in Parliament and for attending parliamentary committees and other departments of the government. In addition there will be a president, and a permanent secretary in whom the organization will be centralized, all to be paid a fixed salary.

At the outset, the suggested scheme would interfere to a minimum amount with the existing generating stations owing to the necessity of the nation to conserve its capital and resources, but when plants under municipal control reach the limit of their capacity, or becoming obsolete must be replaced, it shall be required of them to obtain the board's authority for the expenditure.

There are now several large plants in the country which are highly efficient, modern and capable of extension in large units, and these would be the initial ones in this plan which would embrace the generation system of the country.

The results of lower cost when the supply is greater and vice versa are cumulative, and it is predicted that if the cost can be brought low enough the demand will be so great as absolutely to dwarf the present load. The two chief items of generating cost at present, namely, capital charges and fuel, it is fully expected can be brought to a small fraction of the present average generation costs throughout the country, by the new scheme, besides the fact that this new scheme will materially better the plant factor and the load factor.

Board to Own Transmission System

Of the bulk distribution network, the board will own the main network, and, as circumstances warrant, the subsidiary network will belong either to the board or to the existing operators. With its power the board will have the right to carry overhead or underground mains to any district. It will be necessary to design the bulk network to insure reliability of supply, so that should any plant fail it would not affect the main supply, or if any one section of the bulk network were destroyed the supply of energy would go on automatically to the subsidiary network. The reliability of supply is of the utmost importance, being more important than low cost.

Moreover, it was felt that this bulk supply network should come under the supervision of the board directly, because it will be necessary in giving a supply to any part of the country to determine whether it will pay to run the mains not alone for immediate demands, but also from the larger standpoint of whether giving such supply is for the good of the country as a whole. In this way, many districts would be given a cheap supply of energy, which under ordinary circumstances a commercial company in a small area could not furnish.

It is not proposed to take over the systems for the distribution to the ultimate consumer but to let them remain under their present control, in this way expecting to gain the support of the present operators, for it is believed that it does not matter with them whether they do their own generating or purchase bulk energy at a low cost, provided they retain their own business of supplying energy to the consumer.

Agriculture and Transportation to Benefit

One of the indirect results of the scheme, it is thought, will be the resuscitation of England's canal system, by bringing into use the development of mechanical propulsion on canals. Similarly, it is believed that the agricultural interests of the country will receive a great stimulus from a cheap supply of electrical energy, particularly in the production of fertilizers.

It is felt that the time is now ripe to launch this or a similar scheme on to the public notice. There is evidence on every side that the minds of men are already actively employed in considering what can be done to enable England to support the burden brought about by the war. Because the problem of energy supply can play a leading part in all of these, it is believed that there never has been a more favorable time in which a united electrical progression could rapidly obtain public interest in and public support for its schemes.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Operating Features of a Line Patrolmen's Telephone and Signaling System

BY A. W. LEE

To afford a means for its line patrolmen to report to the main office while on duty, and at the same time keep a check on the points from which reports are made, the Kentucky Pipe Line Company, Louisville, Ky., has installed thirty-one telephone sets and automatic signaling devices at numerous points along its natural-gas pipe-line system where they can be connected with a telephone line paralleling the system. The circuit is about 180 miles long, extending from Inez to Louisville, Ky., and consists of two No. 9 copper conductors. Four of the telephone and signaling sets are permanently connected with the line at Louisville, Lexington, Indian Creek and Inez respectively. The remaining sets are situated on poles at intermediate points 3 miles to 10 miles apart, but are connected with the line only when in use.

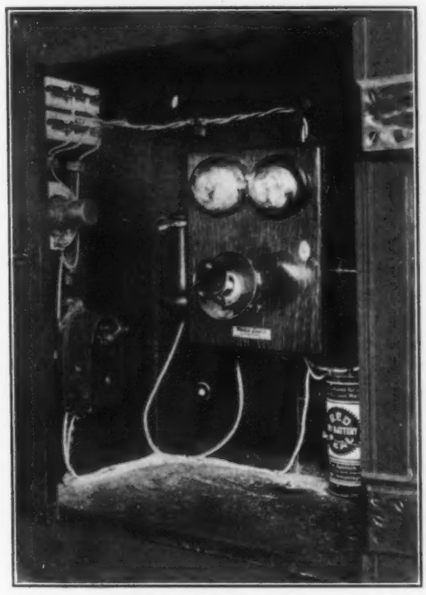


FIG. 1—ARRANGEMENT OF TELEPHONE AND SIGNALING APPARATUS IN A SMALL SLANT ROOF WOOD BOOTH

The signaling devices, which are similar to those used by the Western Union Telegraph Company on watchmen's circuits, contain contact-making wheels that send a code of signals indicating the location of the instrument. One terminal of each signaling device is connected with the middle of the telephone ringing coil and the other to a ground wire. At the Louisville end of the line is a relay similarly connected. Thus a phantom circuit is formed over which signals can be sent without disturbing telephone conversation. While the signaling system was not intended to indicate trouble on the line, actual operation has shown that the system serves this purpose as well except in the case of short-circuits between conductors. This automatic indication of trouble has often saved considerable time in starting to remedy defects because they often happen just before some line walker nearby calls in and would remain unnoticed prior to the adoption of the signal system until he was out of reach for the day.

As indicated in an accompanying drawing, the telephone sets are connected with the line by single-pole double-throw switches, so that in case a circuit is "shorted" or one side of the line is "down" one terminal of the instrument can be immediately switched over to a ground connection and operated on a ground-return system. This arrangement has been found necessary because the length of the line and rough country over which the circuits extend afford numerous opportunities for faults to occur.

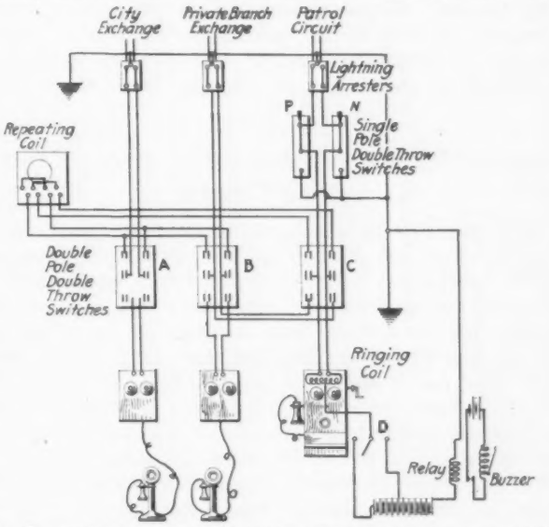


FIG. 2—CONNECTIONS AT LOUISVILLE TERMINAL OF PATROL LINE

The relay operating the buzzer is connected between the middle of the ringing coil and ground with a battery in series. Switch *D* is to cut out a portion of the battery when line leakage is sufficient to actuate the relay. Switches *A*, *B* and *C* are for connecting the patrol circuit with the city or private branch exchange. Switches *P* and *N* permit operating on completely metallic or ground-return system.

In dry weather twelve to fourteen dry cells installed at the Louisville terminal have been found sufficient to operate the telephone and signaling equipment. During rains or heavy snowstorms, however, the line leakage is

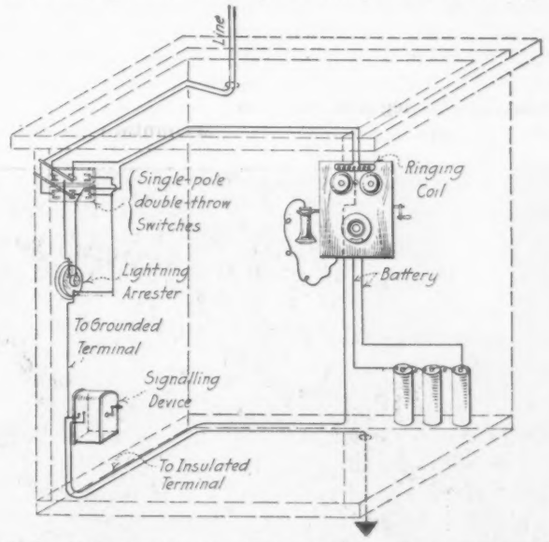


FIG. 3—CONNECTION OF APPARATUS IN LINE PATROL BOOTH

Single-pole double-throw switches in upper left-hand corner permit operating equipment on completely metallic or ground-return system. The signaling mechanism is connected between the middle of the ringing coil and ground.

sufficient to operate the relays with the normal number of batteries connected. For this reason, a switch is provided at the Louisville station so that a third or more of the batteries may be cut out to reduce the leakage current.

Whenever patrolmen desire to call the main or Louisville office from points not near regular stations they connect one terminal of their portable telephone sets with one line and the other terminal with a ground connection and signal the office by making and breaking the contact. The ground connections are easily made, since every fifth pole is equipped with a ground wire for lightning protection. This arrangement obviates the necessity of patrolmen carrying ringing sets, thus making the use of light, portable telephones practicable. The sets carried by the patrolmen on this system consist of the Western Electric inter-communicating type of telephone which has no ringing device.

How Lightning Arrestors Indicated a Peculiar Line Trouble

The operator in a substation connected with a long transmission line recently noticed that his lightning arrestors were discharging regularly at short intervals. Since it was a clear day, and there was apparently no trouble on the line, he was at a loss to know the cause of the disturbance. The line was, however, inspected and after going out from the station, a distance of 19 miles, it was found that the galvanized-iron ground wire above the line had slacked off and was swinging in the wind. Every few minutes it would swing over within spitting distance of the line and cause a surge which resulted in the discharge through the lightning arrestors in the substation 19 miles away. This is one example of the peculiar ways in which surges may manifest themselves, and travel along the line.

How a Downtown Isolated Plant Was Converted Into a Central-Station Substation

By A. J. Goedjen

The Merchants Heat & Light Company of Indianapolis, Ind., has recently completed the first portion of a downtown substation having an ultimate rating of 6000-kw. The site for this station was secured when the company took over the heating and lighting of the Claypool Hotel and secured a long-term lease on the building which had housed the hotel's isolated power plant. The old boilers are now used for heating the hotel and the engines are held in reserve.

A considerable section of the building was suitably

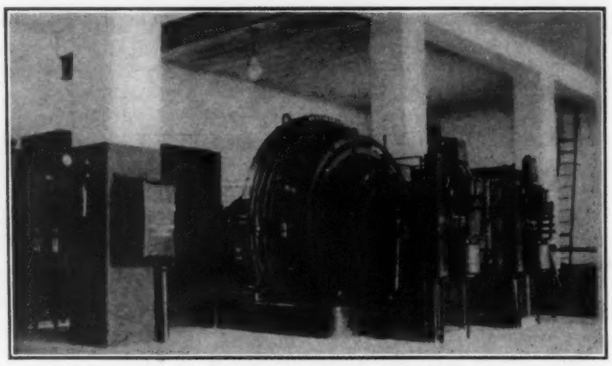


FIG. 2—SYNCHRONOUS CONVERTER INSTALLATION IN BASEMENT OF HOTEL BUILDING IN INDIANAPOLIS, SHOWING CIRCUIT-BREAKER PANELS AT MACHINE

fireproofed and equipped as a substation. One 1500-kw. Westinghouse synchronous booster converter unit, with three 550-kva. single-phase transformers, have already been installed, and a duplicate unit ordered. Sufficient floor space is still left for two additional units and a low-voltage, direct-current booster.

All alternating-current, three-phase, 4000-volt lines enter the basement directly from the manhole in the streets through a well-laid clay conduit run. The potheads, disconnecting switches and potential transformers are mounted in the basement. The alternating-current bus and oil switches are mounted in a poured concrete structure with additional "transite" barriers between phases, as shown in Fig. 1. Standard Westinghouse alternating-current rotary-converter and line panels are employed.

The rotary converter is equipped for alternating-current or direct-current starting. The low-voltage panel is installed near the alternating-current end of the rotary, while two separate panels bearing the direct-current circuit breakers and starting switch are near the direct-current end of the machine to avoid congestion at the main direct-current switchboard.

The direct-current switchboard is split at the center, placing the positive bus at one end and negative bus at the other. Allowance has been made for the use of a double-bus scheme when the station capacity is increased. Direct-current cables leaving the feeder switchboard enter a carefully laid clay conduit run in the basement, which leads directly out into a manhole in the street. All exposed cables are covered with concrete to insure them against injury and the possibility of burning.

A spray air washer having a capacity of 72,000 cu. ft. per minute has been installed, and will be used to supply cool, clean air, particularly during summer.

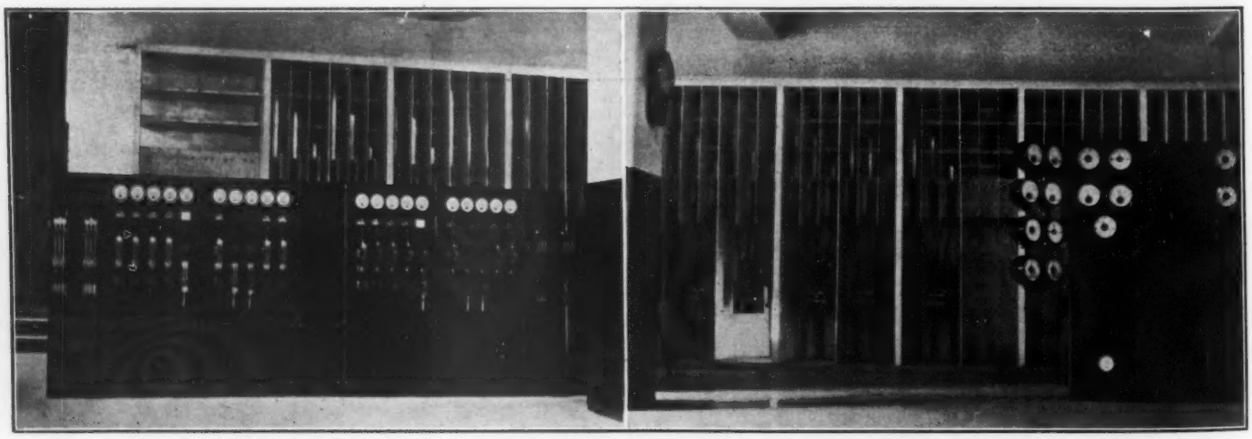


FIG. 1—CONVERTER SWITCHBOARDS AND CONCRETE SWITCH AND BUS STRUCTURES WITH TRANSITE BARRIERS

Conditions That Help to Determine Boilers to Fire

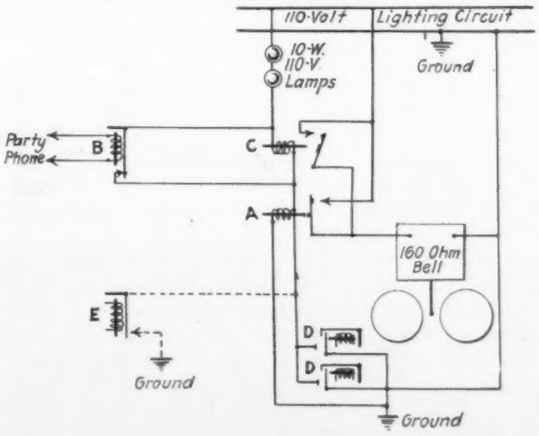
Many operating companies have no set rules for the selection of boilers to operate during a particular period aside from the requirement that each unit shall be shut down periodically for inspection and repair at certain intervals. What appears to be a more satisfactory schedule is followed by an Eastern company.

As a direct result of inspection the location of boilers to be used for the next week is determined. In the order of importance this is determined by the following factors: First, only those boilers which are in first-class condition are allowed on the working list; second, if possible, those boilers at the shortest distance from the turbines are used; third, the boilers are so located that the minimum number of men may be used in their operation; fourth, as many boilers as possible should discharge their products of combustion into the same stack. From a study of the boiler arrangement this electric-service company has also found that if two and a half boilers are allotted per man, with a water tender in charge of each aisle, certain combinations will require more help than others. Draft conditions are better when the chimneys operate with the maximum number of boilers for which they are designed. If they are operated on fewer furnaces, the draft is likely to be reduced. It is of interest to note in this connection that if a little thought is given as to which boilers are to be left on the line hot-banked to furnish steam for cleaning, a considerable saving can be made by using a boiler near those to be cleaned. This materially reduces pipe-line losses.

The Use of Powerful Horns or Bells in Connection with Telephones

BY FRANK T. COLDWELL
Superintendent Mohawk Hydro-Electric Company

On page 1316 of the ELECTRICAL WORLD for Dec. 11, 1915, Harry Restofski suggests operating horns in connection with relays connected to telephone lines. If powerful bells or horns are connected to standard relays or drops, trouble is liable to develop due to the small carrying and "rupturing" capacity of the contacts. If the bell or horn is operated from the 110-volt lighting circuit there is a possibility of the insulation breaking down and a "cross" resulting between the lighting and telephone circuits.



ARRANGEMENTS TO USE LARGE GONG ON POWER STATION TELEPHONE CIRCUIT

In the accompanying diagram a scheme used for several years by the Mohawk Hydro-Electric Company, Ephratah, N. Y., is shown, which has been found to overcome the objections mentioned. There are a number of "direct" telephone lines on which standard drops, represented by *DD*, are used, and a party line to which is connected the special relay *B*. Code signals are used on the party line. In the diagram, *A* and *C* represent ordinary 20-ohm "pony" telegraph relays. The magnets of these relays are connected in series with two 10-watt lamps to the 110-volt grounded lighting circuit. It will be seen that if the drops *DD* fall the magnet of *A* will be short-circuited, releasing the armature of *A* and closing the bell circuit.

Originally the relay of the party line was arranged as shown at *E*. This particular party line is heavily loaded and there is a great variation in the frequency and the voltage of the signaling current. Several designs of home-made relays and one made by a leading manufacturer were tried with unsatisfactory results. Finally the arrangement shown at *B* in connection with the relay *C* was used. It should be noted that relay *B* opens its contacts when the magnet is energized. With this design "fast" code signals are clearly given, and a signal from "central" attempted when a receiver is down comes in as clear as a higher-voltage and lower-frequency signal from the nearest party.

Electric Device for Measuring the Heights of Acid in Tanks

BY M. M. SAMUELS

Glass-tube gages for indicating the depth of liquid in a tank are not suitable when the liquid is an acid. The method generally employed for determining the depth of acid in a tank consists of lowering an iron rod into the tank until it reaches bottom and then measuring the liquid depth on the rod. This method is crude and cumbersome.

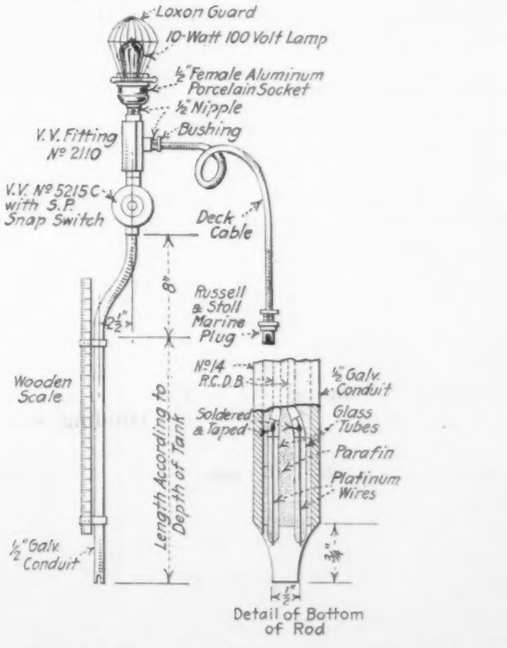


FIG. 1—CONSTRUCTION OF DEVICE FOR MEASURING HEIGHTS OF ACID IN TANKS

At the suggestion of Dr. H. V. Walker, of the Maas & Waldstein Company of Newark, N. J., the writer has worked out a simple electrical device for the purpose, several of which have now been in operation successfully at that company's plant for about a year. Figs. 1 and 2 show the device in its simplest form. Two platinum

wires are heated into small glass tubes approximately 2-in. long. About 1/16-in. of the wire projects at the bottom of the glass tubes for contacts and about 1-in. at the top. A pair of No. 14 rubber-covered, double-braided wires are attached to the top ends of the platinum wires. These glass tubes are inserted in a ½-in. iron conduit, which is then completely filled with paraffin.

A lamp suitably protected by a wire guard is mounted on top of the pipe, as shown at the left in Fig. 1, and a flexible two-conductor deck cable is brought out from the side of the pipe with a strong marine plug attached to its end. A receptacle box furnishing alternating current and mounted on the tank or near it serves as

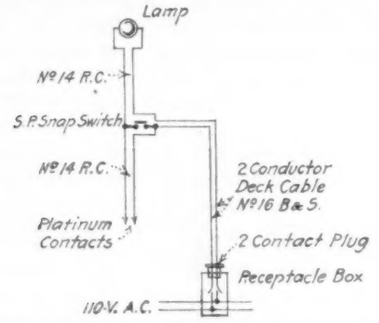


FIG. 2—CONNECTIONS OF CONTACT DEVICE TO 110-VOLT SUPPLY

the source of energy. When the outfit is inserted in the tank the lamp lights up as soon as the platinum contacts touch the acid. The height of the acid can be read directly on a wooden scale attached to the rod.

By several tests it was found that for the particular acid used the drop across the platinum contacts through the acid was about 10 volts, and therefore 100-volt lamps were chosen for a 110-volt source. A switch is inserted in the rod, which short-circuits the platinum contacts and throws the lamp directly across the buses. In this manner the lamp can be tested. This switch is so constructed that it opens automatically as soon as the pressure of the hand is released.

The valve for feeding the acid tank is very often a great distance away from the tanks, and the man operating the tanks has no way of telling when they are filled up to proper depth. A signboard was therefore installed near the valves, with one lamp for each tank connected in multiple with the lamp on the measuring

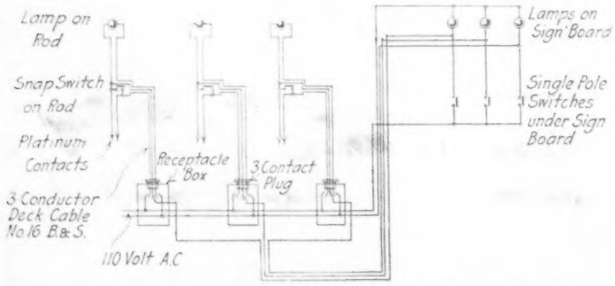

Lamp on Rod
Snap Switch on Rod
Platinum Contacts
3 Conductor Deck Cable No 16 B & S.
Receptacle Box
3 Contact Plug
110 Volt A.C
Lamps on Sign Board
Single Pole Switches under Sign Board

FIG. 3—CONNECTIONS OF DEVICE FOR SET OF THREE ACID TANKS

rod. The rod is held in the tank at such a height that the platinum contacts are located at a point up to which it is intended to fill the acid. As soon as the tank is full the lamp on the signboard will light up. For this purpose the plug has to be of the three-contact type and the cable made with three conductors. A diagram of connections for a set of three tanks is shown in Fig. 3.

In some cases the rod was left permanently in the tank, omitting the lamp on top of the measuring rod and only using the lamp on the signboard. Bells can easily be added to the system to indicate either when the tank is full or when it is empty.

Manipulations of Fuel Bed Required When Burning at High Rates

The operating practice of one large steam station has shown that the highest efficiency of Murphy-stoker equipped boilers operated with natural draft is obtained when they are operated at 135 per cent of normal rating. It is the practice of this station, however, to operate them as high as 250 per cent of rating. This has been found advisable because it is difficult to prevent holes forming in the fuel beds at the lower ratings and because a large number of banked boilers would be required to carry peak loads if 135 per cent rating were the limiting load for each unit.

At high rates of burning the fire tends to clinker and it is necessary to keep a fireman for each 2.5 boilers to keep the fires constantly roused up and properly covered. Long rouse bars are shoved through the holes provided for this purpose and the clinker is broken up somewhat, the air being allowed to circulate more freely through the bed of fuel. It is also necessary to watch the feed of the furnace carefully, in order to secure even distribution of coal. A certain amount of coal must be shaken down by hand at points where it is most needed and the other or thicker parts of the fire allowed to burn out.

With forced draft, as might be expected, the tendency of the coal is to clinker much more rapidly, due to the fact that the temperature of the fuel bed is above the fusing temperature of the ash, causing a much more frequent use of the rouse bars and a closer watch on the fires. The feed conditions need more constant watching at the higher rates. If the feed is set very fast some of the coal will fail to be entirely consumed before it reaches the clinker bar and coke becomes ground away into the ash pit. The feed must then be slowed up and the fire must be kept in motion by the rouse bars.

As a rule it is necessary to clean the fires every other watch. This, however, is left to the water tender in charge of the fires.

Lubricants for Water Turbines and Governor Systems

The Pennsylvania Water & Power Company, McCalls' Ferry, Pa., has experimented with a new semi-solid petroleum grease on its hydraulic turbine gate riggings which are exposed to the corrosive and erosive action of the Susquehanna River water (containing acid and grit) and has found it very satisfactory regarding lasting qualities and protection against corrosion. The company contemplates using it in other similar places, for instance on hand-gate rollers.

The grease employed is practically stable in the presence of alkali or acid solutions of considerable strength, insoluble in water, and adheres very firmly to metallic surfaces. Furthermore, its consistency does not change appreciably over a wide range of temperature. The grease can be applied by means of compression grease cups or with the packings, bushings and bearing surfaces when the mechanism is situated where it has to operate for long periods without attention on the part of station operators.

In its governor system the Pennsylvania Water & Power Company is using a special preparation of oils which combines with water forming an oily emulsion. This obviates the necessity of employing pure oil and still does not cause corrosion of metallic parts as the oil forms a greasy coating on the latter. The lubricant and the grease mentioned are developments of the Crew Levick Company, Philadelphia, Pa.

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

Electric Ranges in Modest Homes

Electric Cooking for $3 a Month in the Utah Company's Territory—The Diminishing Cost of Securing This Business as the Campaign Proceeds

The Utah Power & Light Company of Salt Lake City, Utah, is making every effort to impress upon the public how rapidly electric cooking is being adopted by people of average means. The accompanying reproduction shows a recent double-page newspaper advertisement, which displays the photographs of twenty-odd small homes where electric ranges have been installed. Under the caption "It Pays to Cook by Wire" this advertisement reads:

ELECTRIC FAN TIME—RANGE TIME—NOW!

With summer days come hot—hot kitchens! And for housewives who spend hours over a wood range, constantly feeding it fuel in an effort to get an even cooking heat, and struggling endlessly with dirt, soot and ashes—summer is one long nightmare of kitchen drudgery.

IT PAYS TO "COOK BY WIRE"

Less than $3 a month is the average cost of the electric service necessary to operate the electric ranges in all the homes served by the Utah Power & Light Company. In other words, it costs less than $3 a month to do all the cooking for an average family of five, with an electric range—according to the records of our own electric-range customers.

Everywhere throughout Utah and Idaho, and the Intermountain West, housewives are realizing how easy it is and how economical to discard old-style cook stoves and "cook by wire." Pictured herewith are but a few of the many homes throughout this section where electric cook stoves are used exclusively. The housewives of these homes will tell you how much cooler and more pleasant their kitchens are—how much easier it is to cook with electricity—how much cheaper.

Or, better still, come to our store and let us show you just how simple is the operation of an electric range—how many more things you can cook with electricity—how much better you can cook, and how great is the saving of food and expense. You may buy an electric range in our store on terms convenient to yourself.

W. R. Putnam, sales manager of the company, in commenting on the growth in range business in Salt Lake City says:

"In 1913 we conducted our first range campaign. This resulted in the selling of thirty-eight ranges and our sales expense per range sold amounted to $83.60. In 1914 we put out ninety-nine ranges and our sales expense per range sold was $60.01. In 1915 we sold 526 ranges and our expense per range sold was $17.72, made up as follows: demonstration, $7.24; salary of salesman, $7.11; advertising, $3.37.

"We have found that very active demonstration work is necessary in starting an electric-cooking campaign, as this seems to be the most satisfactory way to convince housewives that electric cooking is feasible. However, we will do less demonstration this year and more direct work with customers, as a very considerable percentage of our prospects now realize that electric cooking is feasible. But our experience has demonstrated that the central station has to do all of the pioneering work with customers in the electric cooking game.

"With the present high prices of electric ranges—high compared with the cost of gas and coal ranges—we find it necessary to sell electric ranges at cost and offer attractive deferred payments extending over a period of twelve months. You can readily appreciate that the dealer or jobber is not in a position to handle this class of business, for it has been our experience that the central station has to spend as sales expense anywhere from $15 to $80 a range.

"We are all anxiously looking forward to the time when dealers will be properly equipped to handle all such merchandising, but we cannot neglect this present opportunity to increase business, and therefore, with

ELECTRIC
FAN TIME-
RANGE TIME-
NOW!
THESE HOMES among many others in the territory served by the Utah Power and Light Company
—ARE EQUIPPED WITH ELECTRIC RANGES
IT PAYS TO "COOK BY WIRE"

A GALAXY OF ELECTRIC-RANGE INSTALLATIONS ON THE LINES OF THE UTAH COMPANY AS PICTURED IN ONE OF ITS PAGE "ADS"

ranges and similar devices, we probably will have to do the merchandising for some years to come. But we feel that the manufacturers should recognize this condition and should assist the central stations in this pioneer work, until the time has arrived when the dealers and jobbers can take over this class of merchandise."

Getting the Tennis Court Into Trim for Summer-Night Games

For the average day worker who is a devotee of tennis, the hours of daylight which can be spent on the courts after business hours are all too short, and many a fast "set" has to be reluctantly given up at gathering darkness. During the past few seasons, however, many courts have been equipped for night playing by the aid

A NEW YORK PHYSICIAN'S ELECTRIC-LIGHTED TENNIS COURT—TWENTY-FOUR 300-WATT TUNGSTEN LAMPS IN REFLECTORS PROVIDE THE ILLUMINATION

of electric light, thus securing for the players an extension of the period of play into the cool of the evening, and so insuring the most delightful hours out of the twenty-four for this active sport with racquet and ball.

Illustrated herewith is the illuminated tennis court belonging to Dr. C. V. Paterno of West 183rd Street, New York City. Twenty-four 300-watt Mazda lamps inclosed in Wheeler reflectors are installed along the side lines, twelve on each side, at a height of 12 ft. above the surface of the court. The tips of the lamps are frosted to prevent the filaments causing glare in the eyes of the players.

Toledo Sells $16,000 in Sweepers

In twenty-seven selling days during the month of March, with twenty-one salesmen on the street, the Toledo (Ohio) Railway & Light Company sold 349 Hoover suction sweepers, which represent a merchandising value of approximately $16,000. It is a remarkable record for the sale of suction sweepers in a single month.

A. K. Young, new-business manager for the company, describes the achievement as follows:

"As far as the details of the campaign go, we handled this as we do our ordinary every-day work. The salesmen were simply asked to bend their every effort during the month of March to sell suction sweepers, and in February each representative prepared a mailing list of his prospective customers for these appliances and sent it to the manufacturer, who took care of the personal letter advertising. Beginning Feb. 26, they sent seven letters a day to each man's territory, and then notified the representatives of the addresses mailed. In this way he could time his call upon the prospective customer the day after the letter was received. This scheme, we found, worked out admirably. We supplemented this advertising with placards in the street cars, with window displays, and with liberal newspaper advertising, from which we obtained very good results.

"After the personal letter had been received an introductory call was made to obtain permission for a free demonstration and a free two-day trial in the home. After the demonstration and trial a follow-up call was made to close the prospect, or if this was not possible, to take the cleaner to some other home for a free demonstration and trial. This plan was carried through so effectively that we 'sold' 83 per cent of our demonstrations, which we think is quite a record."

Public-Spirited Co-operation of Cleveland Company in Civic and Charity Affairs

The plan by which the Cleveland (Ohio) Electric Illuminating Company is soliciting funds for the local Federation for Charity and Philanthropy, through the use of blank spaces on its monthly customers' statements, as recently described in these columns, has now been extended to a still wider field. Every month the printed matter of this charitable organization is carried to the company's 75,000 patrons in the envelopes with the company's statements. With the statements recently mailed was a circular inquiring of the addressees as to their ability to aid in charitable matters. This rather pertinent inquiry is justified on the grounds that "it is the business of charity to know all about everybody," for proper conditions of life and work will do much to eliminate the existence of a "submerged tenth."

It is said that the Cleveland charitable organization has secured 500 new donors through the operation of the plan of the Illuminating company in the three months since it was started. So far all the matter mailed has been educational and there has been little in the way of pleas for help.

Another public matter in which the company has given substantial aid is the campaign for a municipal auditorium or convention hall. The subject of issuing bonds for the purpose was before the voters last Tuesday. During the weeks preceding the day of the balloting, the company erected a beautiful flag over its sign at the side of its building on the Public Square and put out the plea on the sign itself: "Vote for the public hall on April 25. Do it for Cleveland."

What the American Housewife Knows About Electric Cooking

In order to ascertain the actual attitude of the American housewife toward the electric range, one of the range manufacturers recently conducted an investigation embracing twenty cities, scattered across the country, in which men visited homes of every class and questioned the housekeepers. This canvass developed some interesting facts.

It was found, for example, that 26 per cent of all these housewives had thought about the benefits that would come with electric cooking methods, and considered the possibility of their purchasing an electric range. Among these interested prospects 11 per cent definitely stated

that they would be willing to double the cost of cooking to obtain the advantages of cleanliness and convenience, and 27 per cent were willing to increase their cooking expenses by one-half if necessary. These figures alone would seem to indicate a very general interest in the subject and a willingness to pay additional for the very decided benefits offered.

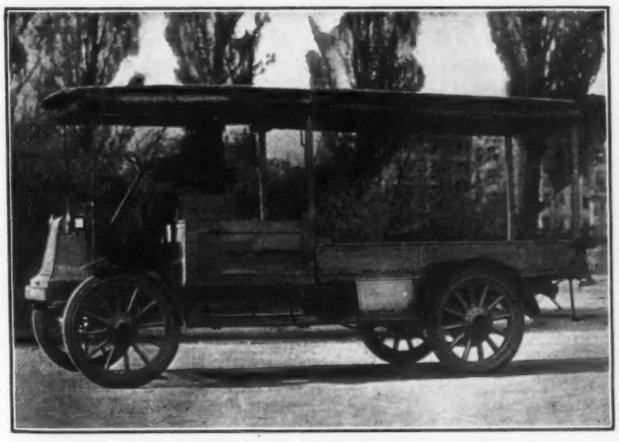
The most notable facts developed by this canvass, however, related to the actual knowledge which these women possessed of the characteristics of electric cooking and the improvements which it makes possible in the preparation of the food. It was found that whereas 37 per cent of all these women knew that the electric range is cleaner than all other stoves, only about 1 per cent had ever realized that electric cooking saves wastage in the food itself, and therefore brings economy in meat bills.

Again, though 24 per cent knew that it is more convenient to use an electric range, only 6 per cent understood that electric cooking is cooler in the kitchen, and only 3 per cent of the housewives knew that it is safer than a gas range.

Not one appreciated the advantage of the constant temperature afforded by the electric range or realized what a very important factor this is in all cooking operations. The investigation demonstrated, in short, that the great need of the moment is for the direct education of the public in the comparative advantages of cooking by the old gas-range and coal-range processes and the new electric range process.

Electric Truck Used to Combat the Gypsy Moth at Concord, Mass.

The 1-ton truck illustrated is operated by the town of Concord, Mass., practically all the year round to combat the attacks of the gypsy moth on the city's beautiful shade trees. The truck carries a maximum crew of five



A PARK BOARD'S ELECTRIC GYPSY-MOTH TRUCK

This 1-ton electric wagon carries a crew of five men and has an extra-long body to hold the ladders, pruning hooks and other equipment used in the work of exterminating the tree moth.

men, with ladders, pruning hooks and the other equipment necessary for the work. The truck itself was furnished by the General Motors Truck Company, and is provided with a 44-cell Gould storage battery. The body was built by the town of Concord, and was made unusually long in order to carry the requisite ladders. The town of Concord has an area of approximately 20 sq. miles, and the truck covers successively the streets of the entire municipality. The truck is charged nightly when in service at the Concord municipal electric lighting plant.

Company Service and Individual Courtesy Over the Telephone

To its 2500 employees the Georgia Railway & Power Company, Atlanta, Ga., has just issued copies of a readable little booklet entitled "Our Service Over the Telephone," which is designed to remind members of the staff of the limitations and possibilities of the telephone when dealing with members of the public over the wire.

"A large and increasing part of our business," begins the booklet, "is transacted through the telephone. To the high standard we have set for ourselves, we want to hold that part of our service which is rendered over the wires. We want to make our relations with the public—and with each other—uniformly courteous and efficient.

EVERY TELEPHONE AN OPEN DOOR

"Each of our telephone stations is an open door across whose threshold any member of the public may appear at any moment and address us.

"Upon our reception of that address and our response to it, we shall be judged—perhaps finally. It may prove to have been our sole opportunity to win that friend.

"Though our business is the marketing of public utility service, we need friends no less than another merchant whose wares are cabbages and cucumbers, or laces and lingerie, or shoes or hats or what not. In other words, the fact that under the laws of economy our business is a monopoly, makes it no different in this regard from the business that has many competitors. Each needs satisfied patrons and commendatory friends. If anything, the monopoly needs them more than does the competitive business.

"Therefore this booklet suggests to you the wisdom of guarding the company's interest and of building and conserving its good name through unfailing courtesy toward your telephone caller, and lively interest in that caller's mission."

Public Service Company Aids in Smoke Prevention at Boston

According to information contained in the report of the Massachusetts Gas & Electric Light Commission which will be available shortly, continued progress is being made in smoke abatement in the portion of Greater Boston under the supervision of the board's inspection department. In the fiscal year 1915 the observed violations of the smoke law represented but 1.5 per cent of the observations on stationary stacks compared with 15.5 per cent in 1911, the first year of the commission's smoke inspection work. Violations by locomotive and marine stacks also showed striking percentage decreases. In the period from 1911 to 1915, inclusive, the commission's inspectors made 131,849 recorded observations on stationary chimneys, the total for the last year of the group being 50,539. Observations were made last year upon 1167 stationary stacks, of which 130 belonged to public service corporations, 646 to manufacturing plants, 388 to office buildings and three to residences.

Smoke was seen to be emitted in excess of the legal allowance in twenty-three public service, 153 manufacturing plant, and ninety office building stacks. It is noteworthy that since 1911 not a single public utility stack has continued to furnish recorded violations of the law at the close of the fiscal year, after being notified by the board that excessive smoke was issuing, and at the end of the 1915 year not a stationary stack of any kind was a continuing violator. But twenty-six complaints have been received by the commission since the inauguration of its supervision of smoke conditions.

Seventeen public hearings have been held, and three prosecutions for violation have been conducted. The late William H. Gerrish was succeeded by Warren A. Edson as chief inspector during the yast year.

The Year's Results of Topeka Wiring Campaign

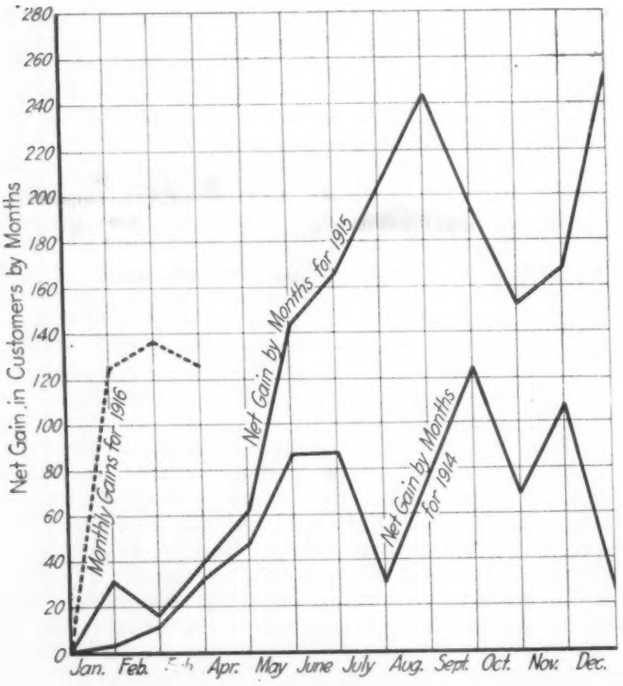
Continuing the house-wiring campaign described in the ELECTRICAL WORLD of Nov. 27, 1915, the Topeka (Kan.) Edison Company is realizing continued and increased success with its plan of maintaining prices to reap an immediate profit on the wiring job. The accompanying curve shows the results of the full year of 1915 as compared with the new houses wired in 1914. The last month of the year, with 252 new customers, proved to be the banner month, and it stands out in bold contrast to the thirty-two new customers of December, 1914, when no special solicitation of new business was in progress.

NET GAIN IN METERS INSTALLED, TOPEKA EDISON COMPANY

	1914	1915	1916
January	3	31	125
February	11	16	137
March	32	39	125
April*	47	62	....
May	88	148	....
June	88	166	....
July	31	216	....
August	78	246	....
September	123	195	....
October	69	152	....
November	108	166	....
December	32	252	....
Total	710	1684	†

*April 5 campaign begun.
†Total during campaign, 1798.

The new customers secured during January and February, 1916, are also shown on the curve chart. These numbered 125 and 137 for the two months respectively, and the figures were considered by the officials to be exceptionally good, since the first two months of the year are frequently cited as "dead" ones by central-station men—a fact also indicated by the figures for the corresponding two months of 1914 and 1915 in the table.



HOUSES WIRED DURING TOPEKA'S YEAR-LONG CAMPAIGN

"Glareless" Flood Lighting for Sheepshead Bay Automobile Speedway

The flood lighting of the Sheepshead Bay automobile speedway, near New York City, together with the illumination of the 160-acre field within the track, work on which is now under way, will make this the largest illuminated area in the world for holding night-time outdoor sporting events, automobile races and military maneuvers. An initial installation of 370 flood-lighting projectors, each containing a 500-watt gas-filled lamp, will be used to illuminate this large space with a light intensity which has never before been attempted on so large a field.

The interior field, which is a fair-sized farm within the 2-mile speedway, will be lighted from 224 flood-lighting projectors spaced around the outer edge and directed upon the field. These units will be installed on poles 30 ft. above the track and will deliver an even-intensity illumination over the total field approximating fifty to 100 times full moonlight. This intensity will be further increased in the section just opposite the grandstand by focusing 114 additional flood-lighting units on this space, the projectors being located at the top of the grandstand and well out of the line of vision. The indirect light from these lamps will also light the boxes in the lower tier of the grandstand.

The 224 projectors around the 2-mile track are arranged so they can be readily turned upon the race course, producing a ribbon of light for the entire 2 miles of 70-ft. track and 30-ft. safety zone. By this arrangement all light sources will be hidden from the eyes of the drivers and the light will come from both sides of the track, always flooding ahead and in the same direction as the speeding machines.

The Speedway will be supplied with service by the Brooklyn Edison Company, from one of its near-by substations, and the lighting units will be furnished by the General Electric Company. A contract has already been signed for 50,000 kw.-hr. for the first year, and after a year or more it is expected that the load will reach 200,000 kw.-hr. per year.

Fifteen Thousand Houses Wired in Sustained Campaign at Cleveland

Under the special wiring offer of the Cleveland Electric Illuminating Company, 15,530 houses have so far been wired and equipped for electric service. More than 4500 homes were wired in 1915, an increase of 700 over 1914, and of 2500 over 1913. This growth is taken to indicate the popularity of the idea which carries with it a minimum cost for wiring and payment in the form of installments distributed over ten months. A number of the contractors also furnish fixtures on the same terms.

Electric-Lighted Rifle Ranges in a Denver Residence

Among the electrical novelties to be found in the new residence of Thomas E. Smith, now nearing completion at Eighth Avenue and Grant Street, Denver, Col., are two 75-ft. rifle-range tubes in the basement. These built-in brick tubes measure 20 in. in diameter, are electrically lighted and are ventilated by a vacuum system, which carries off the smoke. The rifle tubes have electric target carriers. The ranges are entirely under ground, and the target ends are backed up by steel plates.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Projectors and Reflectors

Suggestions on the Use of Reflectors in Connection with Gas-Filled Tungsten Lamps Both for Interior Illumination and for Street Lighting

THE increased intrinsic brilliancy of the modern nitrogen-filled tungsten lamp, owing to the reduced area of the light source, is sometimes considered a disadvantage. In a paper read before the Liverpool Engineering Society, printed somewhat abstracted in London *Electrician* of March 17, 1916, Haydn T. Harrison proposes, however, that this increased intrinsic brilliancy be utilized by combining the lamp with a reflector. He even suggests that the makers of gas-filled lamps should coil the filament as closely together as possible in order to concentrate the light source so that the lamps will lend themselves to more efficient handling by means of reflectors.

He argues that the desire to avoid glare is very natural, but that the usual impression held generally—that the sole cause of glare is the high intrinsic brilliancy of a light source—is wrong. In the author's opinion this is not the fact, for the following reason: If a 10-in. diameter motor-car headlight, producing, say, a maximum of 5000 cp. is compared with an arc lamp which, when inclosed in a 10-in. opalescent globe, also gives 5000 cp., the headlight will appear to be much more glaring than the arc lamp, although the intrinsic brilliancy of the source is the same. The difference lies in the fact that the apparent intrinsic brilliancy of the source tapers off in one case to nothing, whereas in the case of the headlight it ceases nearly abruptly. Thus there is a means of reducing the unpleasant effect of glare without necessarily reducing the high intrinsic brilliancy of the source, namely, by gradually accustoming the eye to the brilliancy.

In considering a lighting problem, the first point to settle is the degree of intrinsic brilliancy of a light source that is harmless and pleasant to the eye. It may be assumed that a shallow glass bowl, equally illuminated all over, would be suitable for an average room. For example, a room 15 ft. square by 12 ft. high would require $15 \times 15 \times 2 = 450$ lumens to produce an average of 2 ft.-candles. If this average were taken at 2 ft. 6 in. above the floor and the light source were 2 ft. 2 in. below the ceiling, these lumens would be directed over a solid angle of about 90 deg. Now, a modern gas-filled electric lamp distributes light equally in nearly all directions. Therefore it will produce lumens equal to 4π times the candle-power, and the candle-power required will be $450\ (4\pi) = 36$, to which must be added certain losses to be considered later, when it has been decided how best to direct the luminous flux over the desired angle.

The method that naturally suggests itself is the use of a reflector that will collect the rays over an angle of 270 deg. and direct them over an angle of 90 deg. But this would mean that, within the angle of 90 deg., the lamp would be visible, and that the only light outside the 90 deg. would be that reflected from the surroundings. Both of these conditions are unpleasant, therefore a diffusing bowl is necessary, and the author suggests one 9 in. in diameter. Having designed the reflector for a spread of 90 deg., if below it were placed a diffusing glass three things result: (1) The visible area of the light source is increased; (2) a loss due to absorption occurs; (3) further diffusing of light occurs. The visible area of the light source is increased to something over 63 sq. in., depending on the depth of the bowl. Therefore the intrinsic brilliancy of the light source is reduced to less than 4 cp. per square inch, which is about the same as a flat-wick petroleum-lamp flame, generally admitted to be a pleasant light. Thus one of our objects has been attained. The degree of diffusion or dispersion will depend largely on the type of glass used. The depth of the bowl can be regulated to obtain a pleasant but small illumination on the walls up to the height of the light source, which will again be reflected from the walls to illuminate the ceiling sufficiently to cause a good effect. Moreover, the amount of side diffusion can be largely regulated by designing the reflector to concentrate the light in a downward direction; in other words, to produce a nearly parallel beam.

In his work in the Navy the author has been able to produce reflectors which, with a dispersion of 6 deg., produce a mean candle-power about 1000 times that of the original lamp. Let us suppose that such a reflector had been used in the case of the 9-in. fitting previously referred to. Little of the total light flux would then have been lost in the reflector, therefore the only loss would have been the glass absorption. The position of the light source being suitable for distribution in the room, an efficient and pleasing illumination would result, even when using a lamp of a high intrinsic brilliancy.

In the second part of his paper the author takes up the discussion of street lighting. The distance at which an object is visible from a motor car using a headlight of moderate power, is in itself proof that the lighting of roads could be more efficiently carried out without increasing the cost. A 32-cp. lamp provided with a suitable reflector will produce a beam by which a dark-colored object can be seen at a distance of 750 ft. This is to say, with lamps 250 yd. apart illuminating conditions could be produced which would insure public safety, whereas the conditions now are such that with lamps of similar power placed 70 yd. apart the illumination is so bad that traffic is often dangerous.

To suggest that two 32-cp. lamps erected on lamp posts at a distance of 750 ft. would be an improvement on the present method of putting a 60-cp. lamp at distances of 50 to 70 ft., will strike those who have not considered the matter as ridiculous. Nevertheless drivers of fast vehicular traffic rely entirely on the light produced by their own headlights. It is, however, common knowledge that the headlights of vehicles produce glare which might prove a serious drawback to the adoption of concentrated light for street or road lighting purposes. In the case of public lighting there is another means of reducing it, namely, by placing the light sources at such a height that the most powerful rays are only within the line of vision when the lamps are viewed from a distance, and as the observer nears the light source the candle-power of the beam reaching his eye is reduced. This method also has the advantage of

following the correct curve necessary for even illumination.

There is no insuperable difficulty in raising the height of lamps for street lighting, especially if they are not heavy or bulky. It has been the practice for some time to erect lamps of 1000 cp. or over at a height exceeding 16 ft. from the ground, with the object of obtaining better distribution. The light sources which have been described are of comparatively small weight and bulk, and, though of low spherical candle-power, are producing, as far as their particular purpose is concerned, a candle-power far in excess of 1000, and, therefore, should be placed at a higher level.

Such a scheme in practice would work out somewhat as follows: Take, for example, a road 50 ft. wide, which it is desired to illuminate up to the standard of 0.1 ft. candles minimum horizontal illumination. If two lamps be used at each lighting source fitted with reflectors of the projector pattern, it will be found that, with a spacing equal to 100 yd. between each post and the lamps placed at 20 ft. above the ground, the following candle-power of the beam is required (approximate):

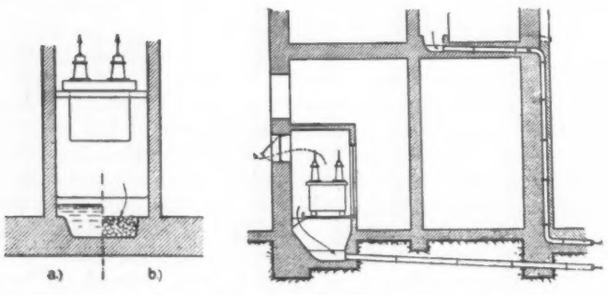
Over an angle of 20 deg. (1750 lumens)	17,500 cp.
Over an angle of 20 to 27 deg. (350 lumens)	5,500 cp.
Over an angle of 27 to 45 deg. (125 lumens)	800 cp.

These figures must be halved, as two lamps are covering the same ground from opposite directions.

With a reflector correctly designed this result could be produced with a lamp giving 93 mean spherical candle-power, or allowing for losses in reflectors, say, a 125-cp. lamp. There being two such lamps on each post, the electrical energy required at 0.7 watt per mean spherical candle-power would amount to 175 watts per post. And as there would be only 17 posts to the mile, the total energy required per mile of lighting would be under 3 kw.

Installations, Systems and Appliances

Oil Switches.—Wyssling.—The second report of the Commission of High-Tension Apparatus and Fire Protection of the Swiss Electrical Society, dealing especially with improvements in the general arrangement of installations. It has been found necessary to leave openings in the oil-containers of oil-switches to prevent the containers from bursting when internal explosions take place. It is, therefore, necessary to take precautions to prevent the oil issuing from such openings from spreading. Cellular subdivision by solid walls and the provision of oil wells on the ground form the best protection. Fig. 1 shows an oil switch in a cellular compartment with an oil well, and Fig. 1*b* shows the well partly filled with sand or gravel to cool the heated oil. The cooling of the oil and extinguishing of flame may also be effected by placing perforated metal covers over the well. A further method is shown in Fig. 2, in which pipes are provided to carry off burning oil. The same figure shows a flap-opening for giving a relief to the pressure produced by explosions in the chamber, the flap being arranged so as to close itself to stifle a conflagration within the chamber. The admission of volumes of dense smoke into the switch gallery may hinder the attendants in their efforts to extinguish a fire and damage the gear to such an extent that the supply has to be interrupted for considerable periods. To prevent this the switch-cells may be provided with chimneys, and the room occupied by the switchboard attendants should be shut off from the rest of the building. The greatest switch troubles arise on the switching off of short-circuits, and it is, therefore, desirable to reduce the short-circuit power before breaking the circuit. This may be done by the introduction of reactance or preferably ohmic resistance, the reactance or resistance being contained within the switch. Existing switches may be adapted by the addition of auxiliary switches, successively operated by relays with suitably adjusted time-lags.—From *Bull.* No. 8, 1915, of *Schweizer Elek. Verein*, translated in abstract in London *Electrician*, April 7, 1916.



FIGS. 1 AND 2—TWO OIL-SWITCH ARRANGEMENTS THAT PREVENT EXPELLED OIL SPREADING

Electrophysics and Magnetism

Skin Effect.—H. B. Dwight.—A brief mathematical article on the skin effect of a return circuit of two adjacent strap conductors.—*Elec. Journ.*, April, 1916.

Ignition of Gases by Impulse Electric Discharges.—A brief note on a recent paper by W. M. Thornton before the (London) Royal Society. The ignition of gases by impulsive discharge is considered first as a function of sparking distance. It is shown that the shorter the distance the greater the spark, so that the volumes of the least igniting sparks are, in a typical case, the same for all spark lengths. Ignition may occur with intense momentary brush discharge, generally with the true disruptive spark. The products of combustion are found to be ionized and to carry a positive charge. The gases examined were mixtures in air of hydrogen, methane, propane and pentane; of thylene and acetylene; carbon monoxide and cyanogen; coal, gas and a mixture of equal volumes of hydrogen and methane. Hydrogen, propane, pentane and carbon monoxide rise gradually in difficulty as the percentage of oxygen is reduced; methane is ignited by the same spark whatever the percentage of gas may be; acetylene and cyanogen have the "stepped atomic type of ignition"; ethylene is more inflammable in rich mixture. Hydrogen and methane in equal volumes are ignited as methane in type, hydrogen in magnitude. The limits of inflammability of the paraffins are shown to have reached the upper limit when there is twice the volume of combustible gas to that in the mixture for perfect combustion, the lower limit when the volume of oxygen is twice that for perfect combustion less one atom to the molecule. The ignition of coal gas is through methane. Four types of electrical ignition are given, covering all from the most rapid to the slowest rate of discharge from the poles.—London *Electrician*, March 24, 1916.

Atmospheric Electrical Variations at Sunrise and Sunset.—A brief note on a (London) Royal Society paper by E. H. Nichols. Observations were made for a period of fifteen minutes before and fifteen minutes after both sunrise and sunset, using the Wilson compensating gold-leaf electroscope for conductivity and earth-air current, and two Ebert electrometers for measuring the positive and negative electric charges. The results show a decided uniform decrease in the value of the electrical quantities throughout the sunset period, but the solar effect at sunrise is not at all pronounced. The potential curves for Kew Observatory were analyzed for the years 1912 and 1914 for the thirty-minute period at sunrise and sunset, and monthly means obtained for five-minute

intervals, these being corrected for diurnal variation. There is a general increase in the potential at both sunrise and sunset, being more noticeable in the winter months, but there is no evidence of any sudden change. It is possible that the electrical variations observed may be of assistance in elucidating the problems of wireless transmission.—London *Electrician*, March 31, 1916.

Electrochemistry and Batteries

Dry Cells.—W. R. COOPER.—The conclusion of his article on recent developments of the dry cell. After describing two more types of dry cells of British make, the author compares the performance of wet and dry Leclanche cells and shows that dry cells are superior from the point of view of capacity for a given weight. The efficiency in all types generally increases with the size of cell. In the matter of first cost, wet cells generally have an advantage. A dry cell has the disadvantage that when it is exhausted it is of no further use and must be thrown away, unless the manufacturing company makes an allowance for old cells, which is sometimes the case. Wet cells can, of course, be recharged. But fresh electrolyte does very little to put new life into an exhausted cell. It is necessary to renew the depolarizing material as well, and not infrequently the zinc also. Consequently the supposed advantage of being able to re-charge a cell is not a very great one, and, on the other hand, the dry cell is greatly superior in that it is always ready for use and is exceedingly easy to handle. The article is concluded by notes on dry cell testing.—London *Electrician*, April 7, 1916.

Nitric Acid from Ammonia.—G. SCHUEPHAUS.—Some technical details of the process of changing ammonia to nitric acid in use on a large scale in Germany. —*Met. & Chem. Eng'ing*, April 15, 1916.

Units, Measurements and Instruments

Dimensions of Electrical Units.—S. ASCOLI.—The author emphasizes the necessity of retaining what Rücker used to call the "suppressed" dimensions, such as those of dielectric constant and magnetic permeability more especially when units have to be defined and names assigned to them. This is especially to be borne in mind in view of the proposal to use the same unit for such heterogeneous quantities as magnetic field and magnetic induction. The author protests against the long prevalent view, originated by the Paris Congress of 1881, that there is any specially fundamental character in the units of length, mass and time. Any of these can be replaced by others, and systems can be devised in which mass, for instance, is replaced by density or elasticity. The very fact that the dimensions of electromagnetic quantities, expressed in terms of *L*, *M* and *T*, are different in the electrostatic and electromagnetic systems respectively shows that a fourth quantity has been tacitly omitted. But this fourth quantity may be any one of those that enter into the electromagnetic list of quantities. The author characterizes as "extravagant" the assertion that an essentially electromagnetic quantity like inductance should be homogeneous with a length or that resistance should be measurable in meters per second. It is like "measuring the height of a mountain in henries or the speed of a train in ohms!" The author gives examples of a number of other systems in which the units may be arranged. For instance, magnetic pole strength may be assumed as the fourth fundamental quantity and fractional indices thus made to disappear. The same result follows the adoption of current as a fundamental unit as proposed by Giorgi. It is sometimes of advantage to introduce the "constant" of Biot and Savart's magneto-electric force as the fourth quantity. When any quantity is expressed by its full dimensions, these are identical in whichever system they are expressed.—Abstracted from *L'Ellettrotecnica*, Nov. 25, 1915, in London *Electrician*, April 7, 1916.

Frequency Meter.—W. PEUKERT.—The author first gives in tables and diagrams the results of measurements of the effective resistance of iron wires for alternating current. The way in which the effective resistance, voltage and watts consumed depend on the frequency when the current is kept constant is shown in various diagrams. Fig. 3 gives the curves of volts and watts as function of the frequency when the current is kept constant for an iron wire coil of 1.5 mm. diameter with eighty turns. It will be seen that either a voltmeter or a wattmeter can be used for measuring the frequency if the current is kept constant. In order to fulfill the latter condition so that the measurement becomes independent of fluctuation of voltage of the machine, a compensating Nernst resistor (iron wire in a hydrogen atmosphere) is connected in series with the iron wire coil. Tests show that if the voltage of the machine increases either 13 volts above or decreases 13 volts below the normal voltage of 63, the current remains perfectly constant. His frequency meter consists, as shown in Fig. 4, of a volt meter *F M* connected to the terminals of an iron wire coil *Sp* in series with Nernst resistors *Nr.*—*Elek. Zeit.*, Jan. 27, 1916.

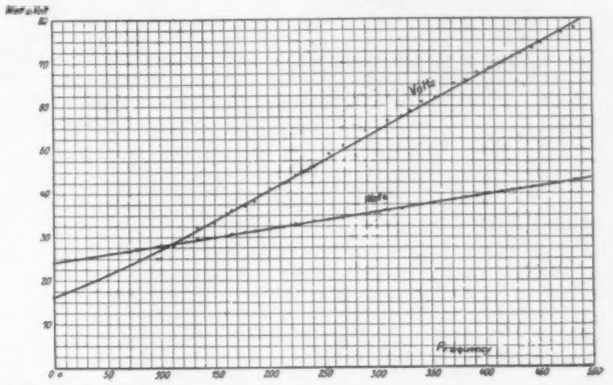


FIG. 3—RATIO OF VOLTS AND WATTS TO FREQUENCY WITH CONSTANT CURRENT THROUGH IRON-WIRE COIL

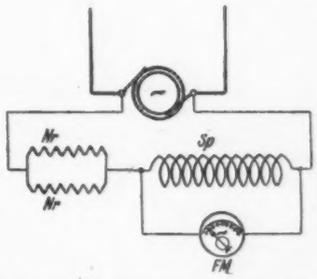


FIG. 4—VOLT METER CONNECTED WITH IRON-WIRE COIL TO MEASURE FREQUENCY

Telegraphy, Telephony and Signals

Wireless Telephony.—PHILIP R. COURSEY.—An abstract of a paper read before the Students' Section of the (British) Institution of Electrical Engineers. The author deals especially with arc methods of generating oscillations, the Fleming oil arc, the Colin-Jeance arc generator, short-spark methods of generating oscillations, the Marconi disc discharger for generating undamped waves, and frequency multipliers.—London *Electrician*, April 7, 1916.

MILO R. MALTBIE

Men of the Industry

Changes in Personnel and Position—Biographical Notes

E. M. BARTON

Milo R. Maltbie, who takes office next week as city chamberlain of New York City, was formerly a member of the Public Service Commission for the First District of the State of New York. In 1913 Mr. Maltbie was appointed chairman of the valuation committee of the National Association of Railway Commissioners, and in 1915 became a member of the advisory board to C. A. Prouty, director of the valuation division of the Interstate Commerce Commission at Washington. In his new position as city chamberlain, Mayor Mitchel has announced his plan to have Mr. Maltbie give particular attention to public service matters as an expert adviser to the administration on public utility subjects.

F. B. Gleason has resigned as Far Eastern manager of the Western Electric Company with headquarters at Tokio, Japan, to become general telephone-sales manager for the company at New York City.

Norman B. Livermore of San Francisco was appointed director of the Pacific Gas & Electric Company at the recent annual meeting of the company's stockholders. Mr. Livermore succeeds Samuel Insull of Chicago, who has retired from the board.

William E. Row, who has been assistant engineer of distribution with the Southern California Edison Company, Los Angeles, Cal., for the last three years, recently left San Francisco for Shanghai, China, where he will become electrical engineer with the A. S. Fobes Company, Ltd.

F. B. Jewett, assistant chief engineer of the Western Electric Company, has been absent from his desk during the last three months owing to trouble with his eyesight. Mr. Jewett has been under the care of a specialist at his home in Wyoming, N. J., and his condition is now so far improved as to permit his going South to recuperate his health.

T. Commerford Martin and **Stephen L. Coles** are collaborating in the preparation of an historical book to be entitled "The Story of Electricity," which is planned as a popular and accurate historical account of the establishment and wonderful development of the electrical industry. Mr. Martin, who is secretary of the National Electric Light Association, was formerly editor of the ELECTRICAL WORLD, and is also well known as the author of several volumes —"Edison, His Life and Inventions," "Inventions and Researches of Nikola Tesla," "Electric Motors," etc.

William Baum, who has been a member of the power and mining engineering department of the General Electric Company at Schenectady, N. Y., has just been appointed professor of electrical engineering in the School of Engineering of Milwaukee. After graduating from the Technical College at Karlsruhe, Germany, where he was an assistant to the late Prof. E. Arnold, Mr. Baum came to the United States in 1902 and entered the engineering department of the General Electric Company at Pittsfield, Mass. In 1907 he went to the induction-motor engineering department at Schenectady, and later joined the power and mining-engineering department in charge of Mr. Rushmore. In 1910 Mr. Baum was sent to Berlin, Germany, as the technical representative of the General Electric Company, and when the war broke out he returned to Schenectady.

Obituary

W. B. Rockwell, manager of the Eastern Pennsylvania Light, Heat & Power Company, Pottsville, Pa., died at a Philadelphia hospital Saturday, April 29. Mr. Rockwell's death followed an operation. His body was removed to Scranton, Pa., for burial.

Arthur J. Walsh, aged thirty years, commercial manager of the Wisconsin Gas & Electric Company at Kenosha, Wis., died on April 9 after a brief illness of appendicitis, followed by an attack of peritonitis. Mr. Walsh was graduated from the engineering school of the University of Wisconsin in 1906.

Enos M. Barton, one of the founders of the Western Electric Company and for twenty years its president, died at his southern home in Biloxie, Miss., May 2, at the age of seventy-two years. It was at the age of twelve that Mr. Barton began work as a messenger in the telegraph office at Watertown, N. Y. Later he became an operator, and also taught school for a time. He attended both the University of Rochester and New York University for brief periods, and during the Civil War worked as a telegraph operator in New York. When in 1869 the Western Union shop at Cleveland, Ohio, was to be abandoned, George W. Shawk, who had been its foreman, bought part of the equipment and engaged in miscellaneous work, including the making of inventors' models. Mr. Barton went into partnership with him; and it is an interesting fact that the larger part of his share of the small capital of this beginning of the Western Electric Company was provided by the placing of a mortgage on his old home in Jefferson County, New York State. After a few months Mr. Shawk sold his interest to Elisha Gray, who had been the shop's best customer, and the firm became Gray & Barton. In 1872 the Western Electric Manufacturing Company was incorporated to continue the business, Gen. Anson Stager being the new president and Mr. Barton its vice-president. The Western Electric Manufacturing Company was kept busy making telephone equipment for the Western Union company during the fierce war waged by that company and the American Bell Telephone Company for the control of the telephone industry. When peace was made in 1879 and the Western Union retired from the telephone field, the Western Electric Company was organized to absorb the Western Electric Manufacturing Company and certain manufacturing licenses of the American Bell Telephone Company. Mr. Barton himself engaged many of the present leading officials of the Western Electric organization. He conceived the plan of erecting the Hawthorne shops of the company on the outskirts of Chicago, and lived to see this plan fully executed. Since Mr. Barton's retirement from the presidency of the company in 1908, he had been chairman of its board of directors.

George Herbert Stockbridge, a well-known electrical patent attorney of New York City, died on April 26 at the age of 64 years. Mr. Stockbridge was a graduate of Bates College, Lewiston, Me., and of the University of Leipsic, Germany. Returning to the United States, he became instructor in electricity at Johns Hopkins University and was later electrical examiner in the Patent Office at Washington. From 1887 to 1889 Mr. Stockbridge was in charge of the electrical patent department of the ELECTRICAL WORLD. Later he became connected with the Westinghouse interests, and was associated with the Cooper Hewitt Electric Company at the time of his death.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Electrically Operated Freezers for Making Ice Cream in Quantities

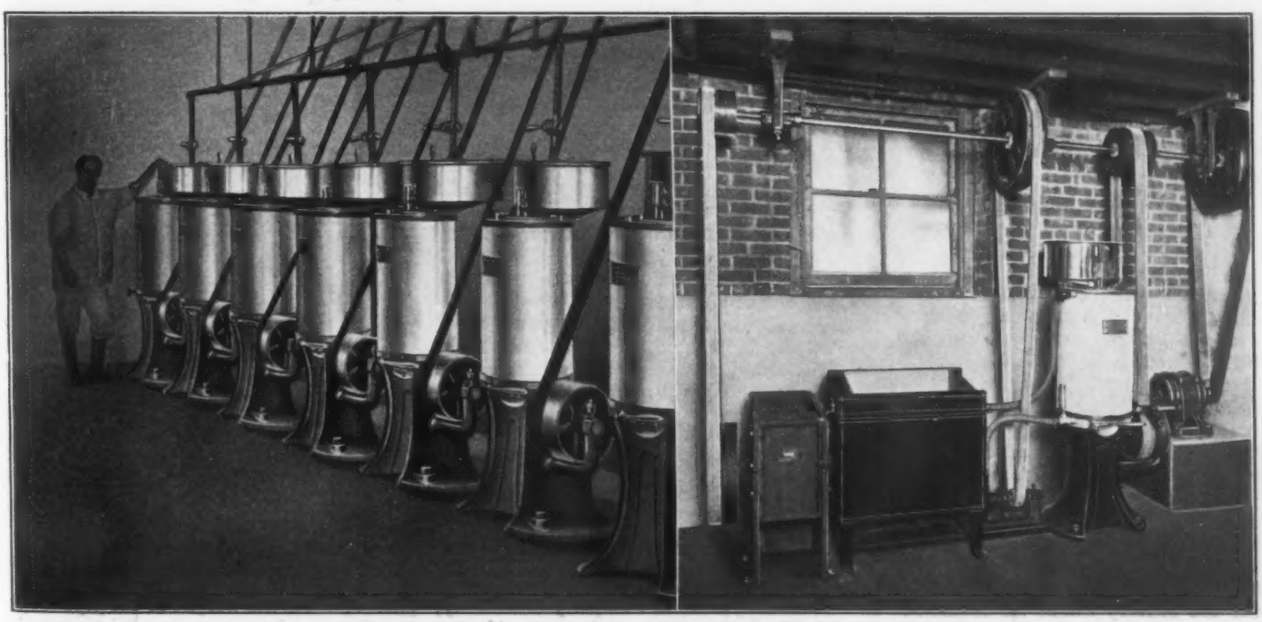
There was a time, and not so long ago at that, when ice cream was considered a luxury, but with its recognition as being a valuable food, and with the ever-increasing demand for it in restaurants, hotels, soda fountains and homes, the manufacture of ice cream is now largely conducted along the lines of large-scale production and the old hand-operated freezers have been replaced, in many cases, by motor-driven machines. In many modern ice-cream factories batteries of freezers are necessary and, figured in the aggregate, the amount of electrical energy required to operate these plants is considerable.

FIG. 1—MOTOR CONNECTED TO FREEZER BY CHAIN DRIVE

In the accompanying illustrations are shown adaptations of electric drive for operating ice-cream freezers in hotels, restaurants, soda fountain plants, etc. In Figs. 3 and 4 are shown machines placed on the market by the Emery Thompson Machine & Supply Company, 235 East Forty-first Street, New York. The latest type of machine developed by this company is provided with an open circulating brine base. The freezing chamber is of German silver and is surrounded by a spiral coil. The brine is pumped from an ice and salt-brine tank to the hollow bottom and thence to the spiral coil. The ice cream is therefore completely

FIG. 2—COMBINED MOTOR-DRIVEN FREEZER AND ICE CRUSHER

surrounded by cold brine and is evenly and uniformly frozen from the sides and the bottom, thus insuring smoothness in the texture of the product. An advantage of the open circulating base, it is pointed out, is that the freezer can be run on a high-temperature brine which means a saving in ice and salt. The machine is equipped with under-



FIGS. 3 AND 4—BATTERY OF ICE-CREAM FREEZERS IN PENNSYLVANIA PLANT AND MACHINE WITH ICE AND SALT-BRINE TANK AND ICE CRUSHER

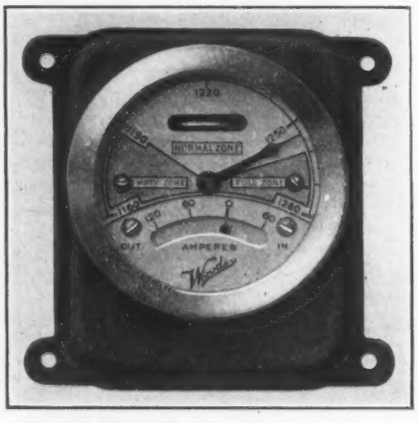
drive gear incased in the capstan stand and packed in clear transmission grease, making the machine run easily and eliminating vibration and noise. With the under-drive gear the top of the freezer is left clear and is open to access. The German-silver cylinder and the outer steel cylinder are clamped into the freezer heads with 0.5-in. tie rods. Contraction and expansion due to change of temperature from the cold refrigerant to the hot drenching water, it is claimed, will not cause the cylinders to crack or leak. The bottom part of the freezing receptacle is cast in one piece and is threaded for a 1-in. brine inlet. The top head is also cast in one piece, is of bronze and extends down so as to form part of the brineway; the bottom is also threaded for the brine outlet. The paddles and scraper frame are of a composition of stiffened bronze, double tinned, and machined at the turns. The scrapers cut cleanly, leaving no frozen layer of cream, it is claimed, inside the shell. The scrapers and central heater revolve in opposite directions, the double motion producing an extra swell. French creams require but little swell and are made by leaving out the central beater. The brine pumps are of either the open impeller or volute types. The freezer and brine tank are connected by four-ply wire-wound hose. The freezer is adapted for either belt drive, as shown in the illustration, or for direct drive.

The latest electric freezer placed on the market by the Peerless Freezer Company, Winchendon, Mass., is shown in Fig. 1. It is entirely self-contained and the motor is connected to the freezer by means of chain drive.

Another interesting self-contained ice-cream making outfit is shown in Fig. 2 and is being manufactured by the F. E. Whitney Company, 65 Sudbury Street, Boston, Mass. This Type S machine, as it is called, is a combination freezer and ice crusher, being mounted on a single substantial iron base occupying little floor space and insuring the necessary rigidity for successful, continuous operation. The crusher can be disengaged quickly by means of a sliding gear. The beater blades are turned in a direction opposite to that of the can, insuring, it is declared, a large, "smooth" and uniform product. The machine is operated by a General Electric motor and is being made with capacities of 4.5 gal, 6 gal. and 10 gal.

Ampere-Hour Meter Applied to Gas-Electric Car

In connection with the announcement of the new gas-electric car of the Woods Motor Vehicle Company, it is interesting to note that the successful operation of the battery of this car depends upon a "Sangamometer" Type MS ampere-hour meter manufactured by the Sangamo Electric Company of Springfield, Ill. An interesting feature of the meter as applied on this car is the special dial designed by the Woods company, which instead of reading in ampere-hours, as usual, reads in specific



METER FOR USE ON GASOLINE-ELECTRIC CAR THAT READS IN SPECIFIC GRAVITIES

gravities. On the dial, as shown in the illustration of the meter herewith, there are also two red areas marked respectively "empty zone" and "full zone." The large white area between, from specific gravity of 1190 to 1260, is marked "normal zone."

As will be understood from the description of this car which appeared in the ELECTRICAL WORLD of March 25, 1916, no charging from an outside source is required as the mutual action of the gas engine and the electric motor-generator provides ample charge for the battery under all conditions of operation. With this arrangement, however, it is absolutely necessary to have an indicating device which will show that the system is operating properly, and for this purpose the meter is provided. The operation is correctly indicated at all times, and a person driving the car, simply notes the position of the hand on the meter dial, and so long as this is within the area marked "normal zone," the driver knows that the battery is operating within the best range so as to keep it in perfect condition. If under special conditions the hand gets into the "empty zone" it is necessary to operate the car for a time until the battery is restored to a higher condition of charge. After the hand gets into the "full zone" the driver will understand that the battery is receiving more charge than necessary, and by simple regulation of the two levers on the steering wheel a reduced charge is obtained and the hand brought back within the normal zone.

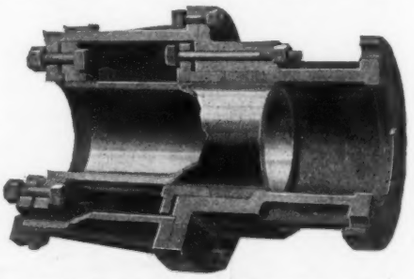
On the lower part of the dial is an ammeter or current indicator scale, showing discharge at the left and charge at the right. With this indicator the operator can observe at any moment whether the battery is taking charge, that is, whether the vehicle is being operated as a gas car, and at the same time charging the battery, in which case the indicator will be to the right of zero, or whether the vehicle is being operated as a combined gas and electric car where the electric batteries and motor are assisting the gas engine, in which case the indicator is to the left of zero, or whether the gas engine alone is operating the car, in which case the battery is neither charging nor discharging and where the indicator will be at zero, or whether the vehicle is being operated as a straight electrically driven car, in which case the indicator will be to the left of zero.

Electric Ranges

In an article entitled "Ranges with Sheathed-Wire Heating Units," which appeared in the ELECTRICAL WORLD of April 15, page 898, and which is descriptive of ranges manufactured by Rathbone, Sand & Company of Albany, N. Y., it was stated that all the hot plates operate on three heats, taking 100 watts, 250 watts and 500 watts respectively. These figures are wrong and they should be 250 watts, 500 watts and 1000 watts.

Pipe-Line Expansion Joint

The crosshead-guided expansion joint shown herewith is designed to relieve completely pipe lines, joints and fittings from all stresses due to expansion and contraction, and is said to be adapted to all service for which pipe lines are designed. Joints are being made with two lengths of sleeves, having a total free travel of 4 in. and 8 in. respectively, and are sensitive, it is asserted, to the slightest variation in pipe length. Referring to the illustration, the mechanical principle is similar to that of the piston rod, stuffing box, crosshead and guides of an ordinary steam engine.



CROSSHEAD-GUIDED EXPANSION JOINT

The main casting is divided into two parts for the purpose of accessibility, and is connected by heavy flanges and bolts. The guide and body are heavily ribbed, and the whole joint is strong and rigid. The expansion or moving element consists of a long sleeve, made steamtight by a long stuffing box and gland. The sleeve is supported at the outer end by companion flanges, having an accurately machined periphery for a sliding fit in the guide. The flanges slide freely in the guide, the internal surface of which is also machined to assure perfect alignment. This crosshead principle keeps the sleeve in alignment and relieves both the sleeve and packing from the weight of the pipe line, sagging strains, excessive friction and prevents wear on the packing and consequent leakage. In this way, the line

is kept free from stress both when hot and when cold. Tie bolts are utilized to prevent the crosshead from being drawn out of the casing and the joint drawn apart.

The stuffing box is readily accessible by removing the bolts on the guide flange and sliding off the guide casing. The packing space of the stuffing box is long, and can be packed with any kind of metallic or fibrous packing. This forms a steamtight joint that requires practically no attention, but should the packing gland require drawing up, this is done from the outside without disturbing any part of the fitting. For pressures up to 150 lb. all parts with the exception of the sleeve are made of semi-steel, and for higher pressures cast steel is employed. As the inner area of the slipping section is equal to the area of the pipe and moves freely, a perfect balance is secured in the joint which relieves the stress that would otherwise be brought to bear on the flanges and fittings. The joint is a standard fitting with standard pipe connections, and can be carried in stock for immediate shipment. Combinations of two or more expansion joints with standard tees and fittings can be used to take care of excessive movement in an installation. Anchorage footings are cast on those types intended for use at all points in the lines where elbows or tees for branch lines are located, and where support is required to carry the weight of vertical pipes and fittings.

The crosshead-guided expansion joint is being made by the Ross Heater & Manufacturing Company, Buffalo, N. Y., in standard sizes for all pressures up to 200 lb. per square inch and for all sizes of pipes up to and including 24 in. in diameter.

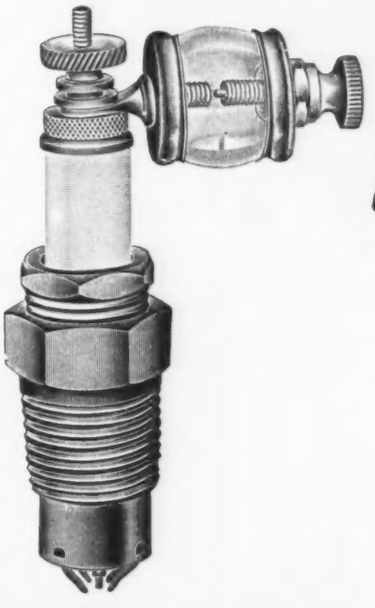
Single-Phase Motors

In a new line of single-phase motors designated by the manufacturer, the General Electric Company, Schenectady, N. Y., as Type "RI" Form C machines, a high-power factor at no load is claimed and practical unity at the usual operating loads. It is also claimed that the torque—starting, accelerating and maximum running values considered—provides ample turning moment to meet practically all the demands of electric drive. In reduced number of parts, absence of centrifugal devices, simplicity and strength of brush rigging, care in insulation and the protection of vital parts, the "RI" line is especially noteworthy, the manufacturer points out. The motors are being built with ratings of from 0.25 hp. to 20 hp., inclusive. A simple change in the connections of outgoing leads makes the machines adaptable for either 110-volt or 220-volt circuits. A feature indicating the flexibility of design is that of speed adaptation, *e. g.*, a given speed obtained through standard 60-cycle windings may also be secured for 25-cycle or 40-cycle frequencies by simply modifying the windings.

SIXTY-CYCLE SINGLE-PHASE MOTOR

Spark-Plug Intensifier

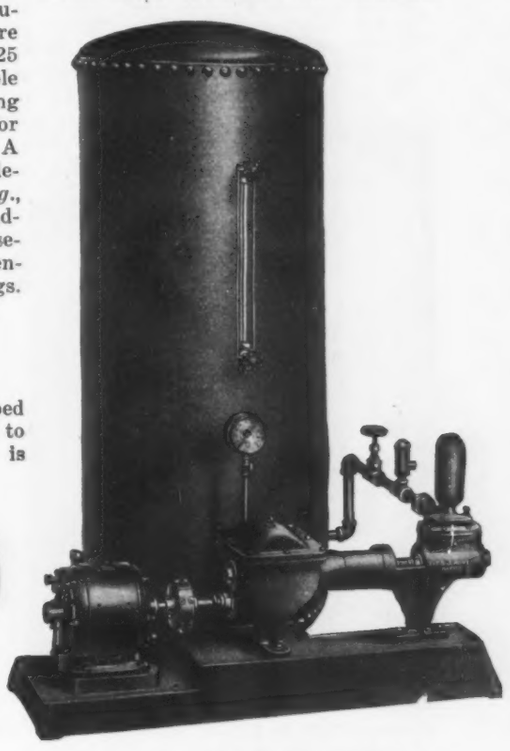
A device which has been developed by the Bigelow Company of Chicago to overcome various ignition troubles is the spark-plug "intensifier," as it is called, shown herewith. The attachment is designed to intensify the spark, thus providing better ignition. The device is screwed into the spark plug as shown. It is especially adapted for use on automobiles, producing hotter explosions and increasing the efficiency of the engine.



INTENSIFIER ATTACHED TO SPARK PLUG

Electric House Pumping Outfit

To meet the demand for a small electrically operated pumping unit which can be driven with a small amount of attention, the George J. Roberts Company, Dayton, Ohio, has developed the directly connected pump shown herewith which is provided with inclosed working parts running in oil. Pumps of various sizes are being built for operation by motors of any voltage or cycle desired. They are being made with ratings of from 200 gal. per hour to 900 gal. per hour. The pumps are especially suited for pumping cistern and well water in country and suburban residences, to boost the city water-supply system in city residences and for various other purposes in hotels, small factories, etc.



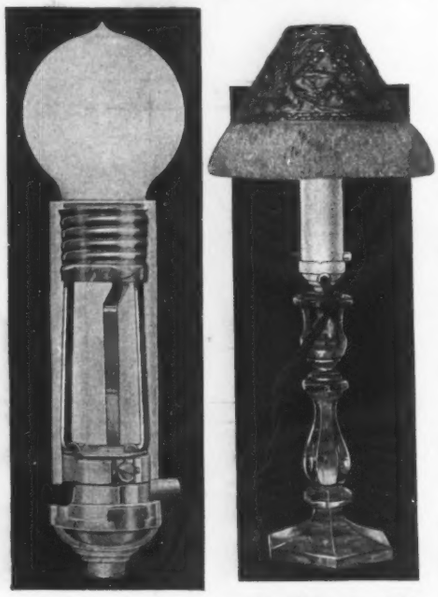
DIRECTLY CONNECTED PUMPING UNIT

Lamp Sockets

Because of the greatly increasing use of candle-type fixtures the development of new candle-length sockets shown herewith by the Cutler-Hammer Manufacturing Company of Milwaukee is of interest. In these sockets the standard screw shell for receiving the lamp is placed at the top of a 4-in. candle, while, as shown in the accompanying phantom view, the usual push-button mechanism and binding screws are at the bottom, this portion being identical with that used in the standard-type sockets made by the above-mentioned manufacturer. In place of the brass shell a tube of fiber is employed which fits securely into the cap. This type of candle socket is neat in appearance, and is very easy to wire, the conductors being secured under the binding screws in the regular way. No other wiring from switch mechanism to screw shell at the top is required. This shell is mounted on substantial supports which also act as conductors. The whole device is in one piece, and therefore the need of stocking and handling the various parts usually required is eliminated, and the amount of work necessary in constructing the fixtures is reduced. The screw shell at the top is of standard type and regular Edison screw-base lamps may therefore be used.

Two styles of candle-length sockets

are being made, one being suited for ceiling or wall fixtures, and the other being particularly adapted for use with portable fixtures. The latter style has an extra outlet in the side of the cap. In the position of the portable lamp shown in Fig. 2 the extra outlet and the method of bringing the cord out of



FIGS. 1 AND 2—PHANTOM VIEW OF CANDLE-LENGTH SOCKET AND APPLICATION OF SOCKET WITH SIDE OUTLET TO "CANDLE-STICK" FIXTURE.

this outlet are shown. The push-button operation is claimed to have several points of advantage, as follows: the buttons are inconspicuous; they operate by a slight pressure of the finger tip, and with portable fixtures there is no tendency to pull the lamp over. When desired these sockets are furnished without operating mechanism. The

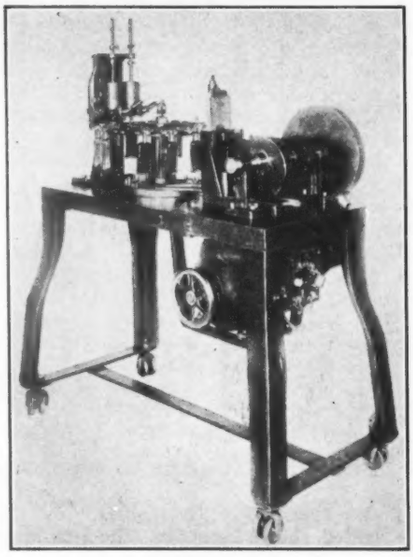
FIG. 3—APPLICATION OF SIDE-OUTLET SOCKET TO PORTABLE LAMP

sockets have ratings of 660 watts at 250 volts.

Another new development is the new No. 7560 side-outlet socket, which is like the standard Cutler-Hammer push-button lamp socket except that it has an extra outlet in the cap. This outlet provides a passage for the conductors, and the support for the socket may therefore be a gas fixture, a rod or other solid pedestal instead of a pipe or tube. Since no wiring is necessary for such fixtures it is possible to make up attractive table lamps and portable fixtures quickly and at a low price.

Motor-Driven Bottling Machine

The Standard Automatic Machine Company of Rochester, N. Y., has recently developed a machine which is designed to fill and cork bottles in one operation. In the machine shown in the illustration one operator places the bottle in the jaws on the dial of the machine. This dial moves the bottle under a pump which delivers a fixed amount of liquid to the bottle. The bottle is then carried on past another operator who places a cork in its neck which is driven into place by a mechanism through which the bottle passes. The jaws holding the neck of the bottle are then opened and the bottle drops into a chute or conveyor



ELECTRIC BOTTLING AND CORKING MACHINE

on which it is carried away. The machine is unusual in that it combines both filling and corking in one mechanism and each bottle receives an accurate amount of liquid. It is designed to operate at a number of different speeds to adjust for the capacity of the bottle, the number of pumps used, and the speed of bottling desired. On large bottles as high as four pumps may be used, part of the bottle being filled by the first pump and the remainder by the succeeding pumps. In this way, the same speed can be obtained with large as with small bottles. The machine may also be used to fill containers such as polish cans, and set the caps; for this work it can fill from twenty cans to sixty cans per minute with two operators. The machine is equipped with a 1-hp. direct-current adjustable-speed motor made by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The motor, which is of the inclosed type designed to operate in damp places, is shown mounted under the table of the machine. The variation in speed is obtained by either automatic or hand control.

Dimming Sockets

Various kinds of fixtures, including those of the portable and bracket types, may now be equipped with dimming sockets developed by the Wirt Com-

FIG. 1—DIMMING SOCKET WITH 2.25-IN. HOLDER

pany, Germantown, Philadelphia, Pa. According to the manufacturer, with these devices the consumer is enabled to get every advantage out of electric lighting, and to turn his light up or down "just like gas," giving five changes—"full," "half," "dim," "nite-lite" and "out"—with a saving in current, it is pointed out, of from 30 per cent to 80 per cent, depending on the degree of turn-down. Any lamp is a turn-down lamp when used in these sockets. The devices are designed for permanent attachment to fixtures with thread and set screw in the same manner as ordinary sockets are attached. The No. 31 socket shown in Fig. 1 is provided with a 2.25-in. holder, and is designed for use on lighting fixtures in halls, bathrooms, bedrooms, nurseries, etc. The No. 32 device shown in Fig. 2

FIGS. 2 AND 3—PORTABLE-LAMP DIMMING SOCKET

is designed for use with portable, piano, and stand lamps and other types of fixtures. Both sockets can be used on any fixtures where direct control of the socket is desired.

Disk-Type Strain and Pin-Supported Insulators

Disk strain insulators and pin-supported line insulators invented by Louis Steinberger of Brooklyn, N. Y., pos-

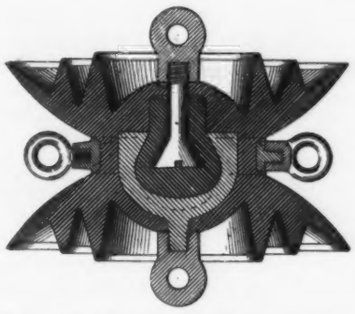


FIG. 1—STRAIN INSULATOR HAVING DISKS WITH OUTWARDLY EXTENDING MEMBERS

sessing a number of novel and important features, are shown in the accompanying illustrations.

The strain insulator is provided with a plurality of disk members integral with the body portion, as shown in the sectional view in Fig. 1. The outwardly extending members of annular form are made integral with and formed on one side of each of the disks, as shown in the illustration, for the purpose of providing a large amount of surface to take care of possible leakage of current. Disk strain insulators are also made with a plurality of plain disks formed integrally with the body portion, as shown in Fig. 2. Basket and bolt types of metallic strain members are embedded within the body portion, but insulated from each other by a fireproof material, as shown. The eyes or terminals of the strain members are detachable, and terminals of other forms, and for other and special uses, such as clevises, sockets, threaded studs, etc., may be employed when desired or required.

When these insulators are employed for supporting arc lamps, etc., a metal ring is molded or placed around the body portion intermediate of the two disks, as shown in the illustration. The

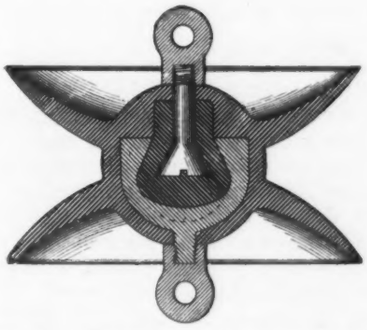


FIG. 2— STRAIN INSULATOR WITH PLAIN DISKS

device may then receive mechanical stresses in four directions.

The metal annular rings engaging the peripheral edges of the disks, and the outwardly extending annular members, as well as the metal ring encircling the body portion of the insulator, and as shown on the pin-type insulator, also on the disks or hoods, possess noteworthy features, namely, equalizing the dielectric stresses, and providing a path for arcs, allowing a harmless dissipation of their energy. They also provide means for the redistribution of the electrostatic field surrounding the insulator, by placing some capacity on its surface. They also practically prevent the puncturing of the insulator by abnormal electrical potential discharges without reducing the effective insulation of the line.

The pin insulator shown in Fig. 3 possesses all of the electrical and mechanical advantages possessed by the disk strain insulator, and in addition it is also practically a lightning-proof insulator, because of the fact that the supporting pin is attached to the insulator instead of penetrating it, as in the ordinary types of pin insulators. The body portion being made up of a solid integral mass of insulating ma-

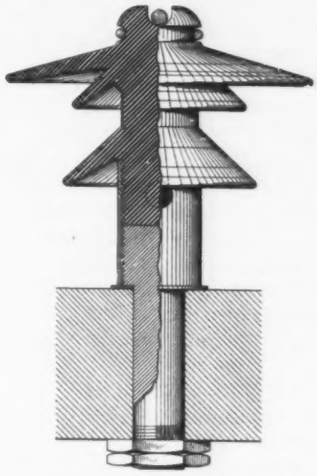


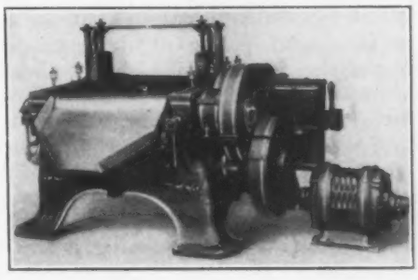
FIG. 3—PIN INSULATOR WITH PIN ATTACHED TO IT INSTEAD OF PENETRATING IT

terial provides very high resistance, and affords no chance for the lightning to puncture it, as the path around the outside of the insulator is of much lower resistance, and the current would naturally follow that path.

The body of the pin insulator shown in Fig. 3 is provided with a plurality of protective annular flanges or disks, the object of which is to maintain certain portions of the insulator dry when moisture is present, and to lengthen the surface distance between the ends of the body portion of the insulator. The outer annular edge of each flange is provided with a ring of conducting material; upon the upper surfaces of the flanges are embedded other conducting rings. These various conducting rings are arranged so as to dissipate as quickly as possible any charge which may tend to travel from the conductors in the upper grooves downward. The rings are so placed as practically to compel the passage of the charge over the surface of the flanges rather than through the material of the flanges or the body portion, so that while some of the rings are relatively close together, they are separated by walls of insulation around which the charge is practically compelled to pass in going from one ring to another. The principle involved in the design of this insulator might be described as embodying a conductor extending from the line to the ground, and comprising alternate annular sections of high and low resistance, the sections of low resistance tending to distribute the charge, when abnormal, and thus to protect the conductor from injury and the sections of high resistance affording ample impedance to the passage of normal charges.

Motor-Driven Ink or Pigment Mill

The demand for a printers' ink or pigment mill to grind inks, flat drying wall paints, enamels and color varnishes, has led to the development by the J. H. Day Company of Cincinnati, Ohio, of the Day Three-roll printers' ink or pigment mill, shown herewith. Large chilled-iron rolls are used for grinding and are mounted on a solid frame which is a single casting. Its great weight eliminates the possibility of vibration, it is asserted, and insures the stability required in producing the finest quality pigment. The bearings for the rolls are very heavy and fitted in large planed housings which are provided with phosphor-bronze bushings of peculiar construction forming an oil-flooded bearing and thus preventing the journals from heating. All the gears are machine cut, have a wide face, heavy pitch, and run as nearly noiseless as possible. To facilitate cleaning, the scraper apron is made adjustable to any angle. It follows the roll, which can be moved in and out by means of a hand wheel, and can be released from contact with the roll, drawn back and readily cleaned. The rolls, which are hollow, can be fitted with packing boxes to admit steam or hot water when desired, or when required the rolls can be water cooled. The illustration shows the machine directly connected to a three-phase induction motor. The motor is of the squirrel-cage, constant-speed type



THREE-ROLL PIGMENT MILL

and is equipped with a hand-operated auto-starter. Both the motor and starter are being manufactured by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa.

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Electrical Concerns Back Plattsburg Idea

More than 100 New England business concerns have notified the Boston (Mass.) enrollment committee for the Plattsburg military training camps that they will permit employees to attend these camps this summer, and in most instances employees will be paid full salaries while taking the training. Among these concerns are the New England Telephone & Telegraph Company; Edison Electric Illuminating Company of Boston; Massachusetts Lighting Companies; Charles H. Tenney & Company, Boston; H. W. Johns-Manville Company, Boston; General Electric Company (Boston office); Fall River Electric Light Company; Warren Steam Pump Company, and many banking organizations, mercantile houses and gas companies. Among the 4000 men New England is likely to send to the camps, public utilities will be well represented.

Problems of Small-Town Utilities Discussed

Four engineers who are familiar with the problems of smaller central station companies presented fifteen-minute papers on different phases of those problems before a joint meeting of the electrical section of the Western Society of Engineers and the Chicago section of the American Institute of Electrical Engineers at Chicago, April 24. A. J. Goedjen, electrical engineer of the Merchants Heat & Light Company, Indianapolis, Ind., by an analysis of 575 existing central stations in six representative states, showed that 15 per cent of these stations are supplying direct current. The remaining 85 per cent are supplying alternating current. While the distribution practice used in connection with the direct-current plants is fairly well standardized, there are twenty-two different combinations of phase, frequency and voltage in use among the alternating-current stations. This fact, the speaker said, showed that any attempt to standardize distribution systems as must be done in the event of interconnecting transmission service, would involve the expenditure of a considerable sum of money. As to the type of distribution system which will probably become most used, Mr. Goedjen said that he personally favored the four-wire three-phase system.

Adam Geschwindt, manager of the Rockford (Ill.) Electric Company, pointed out some of the qualities of a successful public utility manager. He placed the possession of executive ability ahead of the possession of knowledge of the business, since the latter of the two is least difficult to acquire within a short time.

Speaking of the distribution systems for small communities A. Hardgrave of the Middle West Utilities Company, laid particular emphasis on the necessity of keeping investment charges in small-town properties at the minimum. The earning power of such properties is not at all like that of companies in larger cities. As P. Junkersfeld of Chicago pointed out in the discussion, the revenue from residence lighting in Chicago would not meet the Commonwealth Edison Company's payroll. But the revenue from residence lighting in small towns is a major portion of the business. Distribution systems in small towns, not having the great power and commercial lighting revenue nor the increasing revenue from growth in population to draw upon, must be simply and inexpensively constructed.

"The City Manager" was the title of a paper presented by R. L. Fitzgerald, city manager of Winnetka. The first fiscal year for the city-manager form of government closed at Winnetka on March 31. The auditor's report, when it is issued, will show a decrease in the deficit of the general cash account from $4,000 to $2,000, the conversion of a $4,000 deficit in the water department into a cash surplus of $5,000, and an increase in the net earnings of the electric light plant of $20,000.

College Undergraduates to Be Employed for Summer Campaigns

The heating and appliance division of the Commonwealth Edison Company, Chicago, is planning to use a force of forty or fifty salesmen during the summer in a forceful "drive" on domestic appliances. These men will be recruited from the ranks of the undergraduates of the colleges and schools of the Middle West. In a corresponding campaign conducted in the summer of 1915 a similar plan was used with the result that approximately 13,600 appliances were put out and 11,000 of these remained sold. The men are paid on a commission basis. Each receives a drawing account of $12 a week and is paid 50 cents per appliance, except for electric fans, on which 75 cents a piece is paid.

Conduit Company Ordered to Discontinue Issuance of Injurious Circulars

As already noted in these columns, the National Metal Molding Company of Pittsburgh, Pa., won its suit against the Tubular Woven Fabric Company of Pawtucket, R. I., in the Osborn patent, No. 652,806 infringement case covering a flexible non-metallic conduit. However, as noted in these columns on March 18, the defendant advertised to the trade that it would continue to manufacture "Duraduct," stating that it had evolved an improved conduit construction not amenable to the patent restrictions.

The National Metal Molding Company sent out circulars to jobbers relative to the patent litigation, which circulars the Tubular Woven Fabric Company claims are likely to lead to a misapprehension as to the scope of the injunction and to the erroneous impression that the use of the trade name "Duraduct" is enjoined. On April 25, the District Court of the United States for Rhode Island handed down an order restraining the National Metal Molding Company from issuing further letters or circulars similar to those complained of. The company was ordered to supply the Tubular Woven Fabric Company within ten days with a list of all parties to whom it had sent the circulars or letters complained of, and was also ordered to send another letter to each one of the parties to whom the original circulars or letters were sent, stating that "the injunction order does not prohibit the use by the defendant of the trade name 'Duraduct,' upon any article not infringing the adjudicated claims of patent No. 652,806 in suit."

Public Service Commission News

Illinois Commission

In the Lincoln Street Railway cases the commission granted authority to a utility to discontinue completely its street railway operation in the city of Lincoln. The company made a showing for discontinuing an established utility service, based upon continued annual operating losses. The commission held that the company "should not be compelled to continue the further operation of an unprofitable street car business, which it has been adequately demonstrated is not patronized sufficiently by the public of the city of Lincoln to be self-sustaining."

New York Commission

The Public Service Commission for the Second District of New York has announced that it will conduct an investigation of the short-term contracts and contracts terminated before expiration in force by the various telephone corporations throughout the State. May 10 has been set for the first hearing in the matter. From time to time complaint has been made to the commission by telephone subscribers in various parts of the State against charges for telephone service for less than a year, such as service at summer homes, and as to the penalty exacted by the companies when contracts made for the year are canceled in less than that time. The commission hopes to clear the matter up before the summer.

Maine Commission

In discussing rates offered to isolated plants to induce them to shut down their plant and take central station service, the Maine Public Utilities Commission in its first annual report, just published, states that service rendered to these customers should not be understood as constituting a special rate, and should only be permitted where the admitted or proved facts clearly indicate, first, that the business of the customer cannot be secured at regular rates, and, second, that it is in the interest of the general public to permit the company to secure the business of a particular customer and others who may be similarly situated. The commission says: "Whatever the circumstances or necessities may require the company and this commission to do, the service performed should be in accordance with a schedule filed with the commission, open to all, and any contracts thereunder should be for as short a term as possible, to the end that as time goes on and the business of the company increases, the benefit resulting from this low rate to large consumers may be reflected in lower rates to the smaller consumer.

New Jersey Commission

The Board of Public Utility Commissioners has rendered a decision respecting the meaning of "municipality" in connection with county operations, denying approval of a franchise granted to the New York Telephone Company by the Middlesex County Board of Freeholders on the ground that the limited franchise act of 1906 had not been considered. The ordinance provided for the construction and operation of local and through lines over Park Avenue, Raritan Township. The board points out that in granting the franchise the freeholders failed to follow the procedure laid down in the limited franchise act requiring a public hearing as a preliminary to the granting of such a franchise. The telephone company contended that the word "municipality" in the act did not mean or include "county," and therefore compliance with the provisions was not required. In its ruling the board says:

"An examination of the authorities shows that whether or not the word 'municipality' as used in a given statute means 'county' depends upon the legislative intent as expressed in the title and provisions of the statute itself. In some instances the word 'municipality' has been held not to mean 'county,' and in others to mean 'county.' A careful study of the limited franchise act convinces this board that the Legislature in using the word 'municipality' intended to include 'county,' and, therefore, the telephone company in obtaining the municipal consent here submitted for approval is required to comply with the provisions of the limited franchise act. As the company did not so comply with the act, the approval of the resolution is withheld."

Massachusetts Commission

The Gas and Electric Light Commission by a majority decision has approved the petition of the Eastern Massachusetts Electric Company for authority to issue capital stock of the par value of $250,000, the proceeds to be used in meeting expenses associated with the building of a two-circuit, 22,000-volt tie line between the generating plants of the Salem Electric Lighting Company, Malden Electric Company, and the Suburban Gas & Electric Company of Revere. The company has secured virtually all the necessary rights-of-way and locations, and plans to erect substations at the line termini. About 9 miles of overhead line construction and about 5.5 miles of underground construction are required. There was some discussion at the hearing as to whether or not, assuming the expediency of linking these three stations by the proposed line, the public interest would be better served by its ownership by the Eastern company (a new corporation) or by one of the existing corporations. In the majority opinion this question is not open for discussion at this time, but while expressing no opinion with respect to it, it has been reserved for consideration whenever it may become involved in the rates or other public relations of either or all of the three companies in question.

In a dissenting opinion, Commissioner Schaff objects to the capital issue called for on the ground that it is the creation of a distinctly superfluous public service corporation, since under Section 128, Chapter 742, Acts of 1914, the Salem Electric Lighting Company, from which the supply of electricity is to be bought, is fully authorized, subject to the board's approval, to construct the lines in question. The commissioner says: "Moreover, the creation of this corporation is a departure from the policy of the State in this, that there is no opportunity for direct appeal by the people whom it serves and is inconsistent with the declared policy of the board in the 'sliding scale' case now before the Legislature which is urged to pass an act compelling the Boston Consolidated Gas Company to free itself from the Massachusetts Gas Companies, a voluntary association.

The Eastern Massachusetts Electric Company will be in the hands of a like voluntary association, known as the North Boston Lighting Properties, which owns and controls the stock of the Salem, Malden and Suburban companies. It will have no customers save its fellow subsidiaries of the North Boston Lighting Properties, and it may fairly be predicted that it will absorb the surplus profits of the subsidiary companies, which should go to writing off so much of the dead capital in the Malden and Suburban companies as it duplicates. The State has extended every reasonable power and facility for corporations to unite for their own and the public's welfare, and circumstances being just as they are, there is no justifiable reason, it seems to me, for a go-between corporation, and especially one of this character."

Soliciting Jobs From Public Service Companies by City Council No Longer Allowed in Chicago.—After four years of debate and effort on the part of some of the Councilmen, the Chicago City Council on April 27 passed a rule prohibiting members of the Council from soliciting jobs for constituents from public service companies. The rule was passed by a vote of 37 to 32.

Marconi Radio Operators Insured Under a Group Plan.—One thousand employees of the Marconi Wireless Telegraph Company have been insured under a group insurance policy with the Travelers' Insurance Company. The insurance amounts to $500 for each of those employees who have been in the company's service more than a year and $1,000 for those who have been in its employ five or more years.

Engineers to Parade in Favor of Preparedness. — In the great citizens' parade in favor of preparedness, to be held in New York City on May 13, arrangements are now being made to have a division of engineers. Tentative arrangements called for subdivisions including Engineers' Training Battalion, civil engineers, mining engineers, mechanical engineers and electrical engineers. The parade will be entirely non-partisan, and no uniforms, horses or wheeled vehicles or advertising will be permitted.

Civil Service Examination for Electrical Engineer.—On June 3 the Public Service Commission for the First District of New York will hold an examination for an assistant electrical engineer. Appointees for this position will handle work in connection with theoretical computations on the design of electric railroad equipment, and should be thoroughly conversant with and experienced in the design, selection, installation and inspection of electric railway motors, signals, signaling apparatus, etc. Applicants must have had at least six years' recent experience in construction or operation of power stations and heavy traction systems. Graduation in engineering from a school of the highest grade will be accepted as equivalent of four years' experience. The examination is open to non-residents.

Knoxville Signs Street Lighting Contract.—A ten-year contract for street lighting has been entered into by the Knoxville (Tenn.) Railway & Light Company and the city commission, after the commission had spent several months in investigating street lighting in various cities in the East. The contract, at the expiration of five years may be annulled on one year's written notice. It represents a reduction in the cost of 2000-cp. arc lamps of from $72.50 to $54, while at the same time the lighting company agrees to furnish energy for 140 lights on an elaborate "white way" which the city will maintain. The city will use at least 600 arcs and an indefinite number of 25-cp. incandescents at $18 per year, while there are the usual provisions as to outage, etc. A rebate is given by the lighting company which makes the contract virtually retroactive to Oct. 1 last.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

$3,750,000 to Be Asked for Chicago Street Lighting.—If the City Council will approve all requests for bond issue ordinances pending before the voters at the Chicago municipal election in June, a total of $12,707,000 in municipal bonds will be asked for. One item among the proposed issues will be $3,750,000 for increases in the street lighting system.

Louisville Signs Must Remain Lighted Until 10 P. M.—The municipal court in Louisville, Ky., has upheld the legality of the provision of the electric-sign ordinance requiring that electric signs must be kept lighted on both sides, from dusk until 10 o'clock P. M., at least six nights of the week. The city building inspector had brought actions against ten alleged offenders and the court held them all guilty, assessing a fine of $10 in each case. All but one of the fines, however, were suspended.

War No Excuse for Not Filling Order.—In the case of the Western Dry Battery Company of Seattle, Wash., against the Harshaw, Fuller & Goodwin Company, Judge Willis Vickery of the Cuyahoga County Common Pleas Court, Cleveland, Ohio, on April 27 rendered a verdict in favor of the plaintiff and awarded it $6,825 damages, the amount claimed to have been lost because the defendant did not fulfill its contract to deliver 100 tons of manganese, which was made in January, 1914. The price, according to the evidence adduced, was to be $30 a ton, and 28 tons were delivered before the European war broke out. Defendant, however, failed to ship the remaining 72 tons, claiming that this particular quality of manganese is obtained exclusively from Russia and Germany and the blockade of ports made it impossible to obtain it.

Illinois Company Adopts Continuous Meter Reading System.—A continuous meter reading system, proposed by the Westen United Gas & Electric Company, for use in the various Illinois cities in which it operates, has been approved by the Illinois Public Utilities Commission. Under the old system the company read its meters and rendered bills at the first of each month, necessitating the employment of a large number of meter readers who necessarily were idle part of the time. Under the new system the meter readers will make the rounds, reading each meter at regular periods a month apart, but not necessarily at the end of the month. Forty thousand postcards were mailed out to consumers explaining the new plan and asking for approval or disapproval by return mail. The company, in asking approval of the State commission, filed 7000 replies, practically all of which were favorable to the new system.

Wireless Message from Steamer 4870 Miles Distant.—A new sea radio record was established, it is claimed, on April 26, when the operator in the San Francisco beach station of the Federal Telegraph Company picked up the position of the steamship Sierra en route from San Francisco to Sydney, Australia, 4870 miles from port. The time of the position was given as midnight.

Ohio Commission Sets Tentative Date for Completion of Union Gas & Electric Hearing.—May 15 has been set as the tentative date on which the Public Utilities Commission will resume the hearing on the valuation of the property of the Union Gas & Electric Company. This will depend upon the approval of the company's attorneys. It will require two days, it is thought, to complete the hearing, as the company and the commission's representatives are far apart in some of their figures.

Company Must Exhaust Legal Remedies Before Appealing to Court in Tax Valuation Case.—Judge John E. Sater of the Federal District Court at Columbus, Ohio, on April 28 dissolved the temporary injunction granted the Wheeling (W. Va.) Electric Company, restraining the Ohio Tax Commission from placing a valuation on its property in Ohio. The court held that the company has the right to ask for a rehearing before the commission and, hence, has not exhausted its legal rights.

Basis to Be Established for Depreciation on Cleveland Municipal Plant.—It has been decided by the city officials of Cleveland, Ohio, to employ engineers to determine the amount of depreciation on the municipal light plant for the two years it has been in operation and to establish a basis for estimating depreciation. This data, it is said, will be used in defending the city ordinance establishing a flat 3-cent rate for service, which was appealed to the Public Utilities Commission some months ago. Former Light Commissioner F. W. Ballard placed the depreciation at $1,000 per month, but there is nothing to show upon what this amount is based.

Use of Motors for Water Supply Pumping.—The 1915 general statistics of cities of over 30,000 inhabitants, just published by the Bureau of the Census, shows that out of a total of 348,573 hp. used in pumping water for municipal supply systems, 55,076 hp. or 15 per cent of the total was in electric motors. Of the total horsepower employed for pumping, 72.6 per cent was in steam engines. A division of these data into groups accord to the size of cities in which group 1 contained those over 500,000; group 2 those between 300,000 and 500,000; group 3 between 100,000 and 300,000; group 4 between 50,000 and 100,000, and group 5 between 30,000 and 50,000, showed that the largest aggregate horsepower in electric motors, but smallest percentage of total power, was used in group 1. The amount was 19,219 hp. or 12.7 per cent of the total. The next largest amount and largest percentage was in group 5, where a total of 11,010 hp. in electric motors was employed on 26 per cent of the total for that group.

Kansas City Section A. I. E. E.—A Kansas City, Mo., section of the American Institute of Electrical Engineers was organized recently.

Illinois Electrical Contractors.—The semi-annual meeting of the Electrical Contractors' Association of the State of Illinois will be held at Rockford, Ill., on June 16.

Connecticut Electric Light Association.—Members of the Connecticut Electric Light Association met at Ansonia, Conn., on April 13, to discuss vital matters pertaining to the lighting utility business in the State.

Dallas Electric Club and Jovian League.—H. M. Butler national boy scout commissioner of New York City, spoke on the "Boy Scout Movement" at a meeting of the Dallas Electric Club and Jovian League on April 28.

National Electrical Contractors' Association.—The association has just published a new booklet setting forth in detail the work of the national body. George H. Duffield, 41 Martin Building, Utica, N. Y., is secretary.

Los Angeles Jovian League.—At the regular meeting of the Los Angeles Jovian Electric League on April 26 Jesse D. Burks, municipal efficiency director of Los Angeles, spoke on the subject, "Business Methods in Public Business."

Jovian Chapter Electrical League of Cleveland.—J. M. H. Frederick, superintendent of Cleveland public schools, addressed the regular meeting of the Jovian Chapter of the Electrical League of Cleveland on April 27, on the subject, "Cleveland's Schools."

Los Angeles Section, A. I. E. E.—A. W. Childs, superintendent of sales, Southern California Edison Company, spoke before the Los Angeles section of the American Institute of Electrical Engineers on April 21 on "The Electric Range, Its Manufacture, Load Possibilities and Advantage to User."

Institute of Radio Engineers. — A meeting of the Institute of Radio Engineers was held in New York City on May 3, at which time Prof. A. E. Kennelly of Harvard University, who is president of the Institute, and H. A. Affel jointly presented a paper on "Skin Effect Resistance Measurements for Conductors at Radio Frequencies up to 100,000 Cycles per Second."

Pittsfield Section, A. I. E. E.—Edward J. Cheney, electrical engineer of the Public Service Commission of the Second District of New York, gave an illustrated lecture on "Valuation of Electrical Properties" at the Hotel Wendell on April 13, under the auspices of the Pittsfield, Mass., section of the A. I. E. E.

Northeastern Section Pennsylvania Association of Electrical Engineers.—The regular monthly meeting of the Northeastern Section of the Pennsylvania Association of Electrical Engineers was held at Scranton on April 18. The practicability of the electric range was discussed at length, and the general opinion was expressed that the field for the electric range has increased many fold in the last few months.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 1079 of this number.

New York Section, I. E. S.—The regular meeting of the New York Section of the Illuminating Engineering Society is to be held at the Engineering Building on May 11. "Fixture Design and Lighting Glassware" is to be the general subject of the meeting, and the lectures are to be given by Stephen De Kosenko of the Sterling Bronze Company on "Problems in the Design of Lighting Fixtures" and A. Douglas Nash of the Tiffany Furnaces on "Observations of Lighting by a Glass Manufacturer."

Michigan Section, N. E. L. A.—The steamer Rochester has been chartered for the 1916 convention cruise of the Michigan section of the National Electric Light Association. A trip through the 30,000 islands of Georgian Bay has been planned. The boat will leave Detroit at 1 p. m., June 20, will go to Penatang, Parry Sound, Killarney, Sault Ste. Marie, into Lake Superior and will return to Detroit at 9 a. m. June 24. Herbert Silvester, Rochester, Mich., is secretary-treasurer of the association. The price will be $33 per passenger.

Schenectady Section, A. I. E. E.—The 174th meeting of the Schenectady Section of the American Institute of Electrical Engineers was held jointly with the Society of Engineers of Eastern New York at the Union College gymnasium on May 4. W. D'A. Ryan, director of the illuminating engineering laboratory of the General Electric Company, spoke on the "Illumination of the Panama-Pacific International Exposition."

Utah Society of Engineers.—The Utah Society of Engineers held its annual banquet and election of officers in the supper room of the Hotel Utah, Salt Lake City, on April 19. Guy Sterling was elected president; C. J. Ullrich, vice-president; W. A. Wilson, second vice-president; Hugh C. Lewis, secretary, and R. B. Ketchum, member of the executive committee. W. C. Ebaugh presided as toastmaster. Heber M. Wells, city commissioner, responded to the toast, "Municipal Problems," in which he outlined the importance of the engineer in connection with the civic and industrial problems of the municipality, as well as in other walks of life. Rev. Peter A. Simpkin responded to the toast, "Eternal Engineering."

Western New England Section, N. A. E. I.—The quarterly convention of the Western New England section of the National Association of Electrical Inspectors, was held at Holyoke, Mass., on April 12. The purpose of the meeting was to secure a uniform interpretation of the National Electrical Code and the morning and part of the afternoon session was given over to its discussion.

Following the close of the discussion in the afternoon an address was given by Arthur J. Newell of the Roland T. Oakes Company on the "Value of the Electrical Inspector to the Contractor." Luncheon was served at the Hotel Nonotuck, after which the visitors were taken on a trip of inspection, which included visits to the Holyoke dam, electric light plant and other places.

National District Heating Association.—The eighth annual convention of the National District Heating Association will be held at the Hotel Martinique, New York City, on May 16, 17, 18 and 19. The program is as follows: Tuesday morning, May 16—Transaction of certain routine business, followed by the report of the public policy committee of which D. L. Gaskill of Greenville, Ohio, is chairman, and the report of the underground construction committee of which H. A. Woodworth, Indianapolis, Ind., is chairman. Tuesday afternoon—The session will open with the report of the nominating committee, after which a paper on "Factors in the Growth of District Heating" will be read by S. Morgan Bushnell, Chicago, Ill., followed by the report of the station operating committee of which Byron T. Gifford of Grand Rapids, Mich., is chairman. Wednesday morning—Arthur Williams of New York City will deliver an address on "District Heating and Its Relation to Electric Utility Operation," and the report of the educational committee will be made by the chairman, George W. Martin of New York City. Election of officers will follow. Thursday morning—A paper on "Co-operating with the Consumer" will be presented by William J. Baldwin, Jr., chief engineer of the New York Steam Company, followed by an address on "Appraisals of Utility Property" by M. F. Millikan, vice-president of the American Gas & Electric Company. The meeting will conclude with the report of the rate committee, of which A. E. Bettis, Kansas City, Mo., is chairman. Thursday afternoon—The report of the publication and editorial committee will be made, followed in turn by a paper on "Ratio of Economizing Coils of the Different Types of Heating Systems," by W. J. Kline of New York City; the report of the record committee by Chairman A. P. Biggs of Detroit, Mich., and a paper on "Methods by Which Harvard University Buys Steam on a Heat-Unit Basis," by E. G. Bailey of Boston, Mass. Friday morning—The final session will open with a report of the meter committee, of which F. B. Orr, of Chicago, Ill., is chairman. Travis H. Whitney of the Public Service Commission of the First District of New York will deliver an address, after which the report of the delegates to the Pan-American Congress will be made by James A. Donnelly, New York City, and Nelson S. Thompson, Washington, D. C. Various entertainment features have been provided for the ladies who attend the convention. Wednesday afternoon is set apart entirely to a boat ride down New York Bay and up the Hudson past the Palisades. D. L. Gaskill, Greenville, Ohio, is secretary.

Assumption of Risk.—The Supreme Court of New York (157 N. Y. S. 185) held that an experienced lineman assumed the risk incident to the use of an unsuitable ladder when its insufficiency was obvious.

Meter Furnished Customer Free of Charge Unless Otherwise Noted.—Since in the ordinance permitting the Auburn Mutual Lighting & Power Company to operate in the city of Auburn no provision was made to the effect that a rental should be charged for the use of meters, the Supreme Court of Nebraska held (156 N. W. 1075) that it considered a meter would be furnished by the company to a customer free of charge and as a necessary part of the equipment of the company's plant.

Exercise of Care of Power Lines.—The Kentucky Utilities Company was held by the Court of Appeals of Kentucky (181 S.W. 662) to have exercised toward the employees of a telephone company using its poles the highest degree of care that is exacted from persons producing electricity when it was shown that the power company's wires carried its uninsulated 3000-volt line at a height of 35 ft. above the ground, and that the telephone company which had contracted to use these poles was permitted to have its linemen ascend the poles to string telephone wire provided that the wire was placed at a distance of 8½ ft. below the uninsulated power wires.

Expenses Incident to Shifting of Wires and Cables in Municipal Conduit Systems.—In a provision in a lease of ducts for electric wires in a municipal conduit system providing that if the lessor should require, without the consent of the lessee, that the latter shift his cables and wires from one set of ducts to another, that one-half of the expense thereof should be borne by the city, the Court of Appeals of Maryland held (96 A. 804) in the case of the Consolidated Gas, Electric Light & Power Company of Baltimore versus the city of Baltimore, that "expense" includes the cost of additional cable and wires made necessary by enlarging the manholes or changing to another conduit which did not benefit the lessee even though such cables and wires remained assets of the lessee and part of his physical valuation.

Subletting Right-of-Way.—A telephone company with a right-of-way to maintain its lines over the railroad right-of-way, erred in granting permission to string wires upon its poles to a telegraph company, it was held by the Supreme Court of Mississippi (70 S. 833). The telegraph company was held to be a mere trespasser since it entered the premises in good faith on the power of right, and the railroad company could remove from its premises the property of the telegraph company with such force as was reasonably necessary to preserve its own property. A right to compensatory damages was created, however, when the railway cut the telegraph company's lines in a number of places so as to render it practically valueless for the purpose for which it was designed.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Use of Surplus Power of Traction Company by State.—If the State at any time acting through its accredited agency, it was held by the Supreme Court of Washington (154 P. 1110) puts a burden upon a public service corporation which requires the use of its surplus power, it must devote such power to the public use and abandon any private contracts that may hold the sale of such surplus power. In such a case a person who has contracted with a corporation and who has been buying such power, cannot compel specific performance of a contract as against the public right.

Right of Eminent Domain Over Water-Power Sites Between Railway and Power Properties.—Under the law authorizing street railroad companies to build and operate water-power plants and condemn water rights therefor, all water rights are subject to condemnation, it was held by the Supreme Court of North Carolina (86 S. E. 245) in the case of the Blue Ridge Interurban Railway Company versus the Hendersonville Light & Power Company unless they are being use in connection with any power actually used in serving the general public.

Proximate Cause for Injury to Employee Working in Manhole.—A telephone company which failed to furnish its employees with a ladder for use in climbing out of manholes was held by the Appellate Division of the Supreme Court (157 N. Y. S. 627) not liable for an injury to an employee whose hand was run over by a wagon driven close to the guard and red flag furnished by the company when the employee had extended his hand beyond the guard, since the injury could not have been foreseen. The company's negligence was, therefore, held not to be the proximate cause of the injury.

Enjoining Use of Telephone Because of Irreparable Damages in Eminent Domain Case.—The taking of land by a telephone company for the construction and operation of its line, according to the Supreme Court of Errors of Connecticut (96 A. 966) is not done for private use and an owner cannot enjoin the use of the line in front of his premises unless the damages to be anticipated in the future by the continuance of the line and from the use it will be put to will be irreparable. In a court of equity, it was pointed out, the application of an owner aggrieved by the illegal maintenance of lines in front of his premises will not restrain its use by the company on account of the greater evil of inconvenience to the public that the release to the owner would occasion.

An Injunction in Regard to Construction of Transmission Line.—The Supreme Court of Pennsylvania held (96 A. 882) in a case against the Harmony Electric Company where owners of lots facing on an alley endeavored to restrain the company from erecting and maintaining a transmission line along the alley, but where it appears not only that the company's charter authorized it to maintain such a line but that the construction of the proposed line has been authorized by the borough and approved by the public service commission, and where it does not appear that the company has refused to furnish electricity to any applicant in the borough, the complaint will be dismissed, though it appears that the company has agreed with the borough in a contract of questionable validity not to furnish energy within the borough limit.

Assumption of Risk.—An employer must use ordinary care to provide his employees with a reasonably safe place to work, and this rule, it was held by the Appellate Court of Indiana (111 N. E. 198), applies to a line of poles and wires on which a lineman is required to work. The employee assumes risks incidental to the service, and where a lineman was repairing wires from the top of a freight car, the roof of which he knew to be uneven, he assumed the risk from the defect. Should the lineman know that there is no independent system of inspection, he cannot rely on his employer for inspection but must make the necessary tests of safety for himself. On the other hand, if the employer provides a system of inspection, the employee does not assume risks which are not obvious to the ordinary use of the senses and which would have been discovered by an inspection. If the lineman is required by his contract to make an inspection, he cannot recover for injuries resulting from his failure properly to inspect. An employee assumes obvious risks.

Faults in Customers' Appliances Do Not Offset Company's Negligence in Maintaining Dangerous Circuits.—In a suit brought against the city of Thomasville for death caused by coming in contact with a circuit which should have been carrying 110 to 120 volts, where it was shown that the low-tension side had come in contact with the high-tension side of the lines, the fact that there was a defect in the lamp which the decedent switched out whereby he met his death, or that the fuse in the building where the electrocution occurred was capable of conducting a greater current than that required to supply the lighting system of the building, could not affect the necessary conclusion that the dangerous current of the wires intended to convey only low and harmless current was a sufficient cause of the injury, it was held by the Georgia Court of Appeals (87 S. E. 923). Regardless of any defects in the wiring of the building or of the lamps in use therein the proximate cause of the homicide was the negligent admission of a dangerous current.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Small Lighting Plants in Greater Demand

Volume of Buying for Farms, Country Homes and Marine Purposes Recently Materially Increased—Prices Higher

During the last few months manufacturers of small lighting plants have felt a decided increase in business. For marine purposes the demand has increased enormously and the prospects are very bright indeed. Ship building has received a startling impetus, especially for pleasure purposes, and in almost every instance small electric lighting plants are being installed.

For farms, country homes, outlying club houses and other places not in a position to receive central station service the demand has greatly increased. This is attributed primarily to the better condition of business generally.

On the other hand, it is believed that the publicity given to electric lighting for farms by farm journals has been a great factor in stimulating trade. Also the agricultural schools of the country are paying more and more attention to this phase of farm life. The young men graduating from these institutions are equipped with a better knowledge of the possibilities of electricity on the farm. The increasing sale of automobiles to farmers is making them as a class more familiar with gasoline-electric machinery and less liable to make mistakes.

Not the least, perhaps, of the beneficial influences in this trade are, paradoxical as it may seem, the central stations. The lighting utilities, it has been popularly believed, are foes to all isolated plants. This, of course, is true if the companies are in a position to supply these plants with energy. On the other hand, the companies which are expanding their service into the rural districts are keenly aware that it will be some time before they will be able to supply these sparsely settled communities. The necessary capital expenditure and high first cost for the present exclude in a large measure this class of business.

Nevertheless, it is highly desirable that the farmers, though not using central-station service, should be thoroughly familiar with the use of electricity and its possibilities in farm work. It is believed that it will be much easier to talk central-station service to a farmer who already has his farm wired and his motors working than if he has to make this expenditure. Therefore, the public utilities are preaching to unserved rural communities, individual lighting plants. They are teaching the farmer how to use his energy to the best advantage. They are teaching him the use of electrical appliances and motor drive for all kinds of farm use.

Prices for the most part are higher, and where they have not gone up it is generally the intention of making an advance shortly. Prices of raw materials and of labor have advanced to such a degree that it is no longer possible to market the plants at former prices and still show a satisfactory profit. All raw materials, including copper, castings and sulphuric acid for the batteries, have been steadily rising now for some time. If they continue to rise a further advance in price may be expected.

Deliveries of the finished product are as a rule good. Where they are delayed it is due either to freight congestion or to the inability to get prompt delivery of raw materials or both. In some cases the inability to receive prompt delivery of some of the raw materials is a very serious problem. However, previous to this boom there was a good stock of finished plants on hand so that aside from delays during transit deliveries have been very prompt.

With the farm trade there is considerable apprehension regarding credits and collections, not that they are, as a rule, any worse than usual, but that the normal condition is far from satisfactory. This condition is laid principally to the door of the farm implement industry. This industry has built up an enormous volume of business on very long credits and the farmer naturally enough expects the same terms from the dealer in lighting plants. Long credits of six months or more are a serious drawback. They tie up too much capital. Could the credits be brought down to thirty days it is felt that the business of supplying lighting plants would be placed on a much firmer basis. On the other hand, while it is a long time before collections are had, it is pretty certain that the accounts are good. There is not the element of risk in this class of business that there is in many other lines. Farmers, as a rule, own their farms and are therefore responsible buyers.

Government Makes Export Suggestions

The insistent demand for information on foreign-trade subjects has led to the publication of a book of practical suggestions by the Bureau of Foreign and Domestic Commerce, Department of Commerce, under the title, "Export Trade Suggestions." These suggestions are not concerned with the sale of any particular lines of goods in foreign markets, but with the vexing problems which sooner or later confront exporters in every line, such as questions of credit, agencies and packing.

The much-discussed question of extending credits to foreign buyers is gone into at considerable length in the bulletin, as there seems to be a disposition on the part of American exporters to regard as permanent the present short-term and cash business with countries that previously demanded long credits. A special warning on this subject is directed at manufacturers who prefer to do their foreign business direct: "Foreign buyers who are willing to pay you cash now—especially is this true of European buyers—will not do so after the present extraordinary conditions have ceased to exist. You must face the fact that if you intend to do a direct export business you must be prepared to finance your shipments at ninety days' sight or longer. This statement does not mean that you cannot do an export business on any other basis. It means that if you want your money in advance or cash at seaboard you must do business through a middleman."

The absurdity, under present conditions, of turning over Latin-American business to representatives of European concerns without a guarantee of continued representation when the war is over is pointed out. A striking example is cited in connection with the sale of stearic acid in Central America. This product was formerly supplied in considerable quantities, but some years ago a European house put a permanent representative in the field and captured practically the entire trade. The war made it impossible to fill orders from the home plant, so the agent has been buying in the United States. Some American firm is doubtless congratulating itself on the profitable business it is doing, not realizing that it is merely assisting a foreign competitor to hold together his customers until the war is over. The American firm is missing a golden opportunity to put its own man in the field, get in touch with the native market and build up a permanent and profitable business.

Similar practical information is contained in the bulletin, under the following headings: Export policies, representatives and agencies, finances and credit, quotations, postal services, correspondence and translations, co-operation with consuls, packing, advertising, and general trade extension. Contributions are included from consuls, commercial attaches, traveling special agents, from special agents in charge of district offices of the Bureau of Foreign and Domestic Commerce and from Dr. E. E. Pratt, its chief.

Less New Material Being Developed

Since the beginning of the year there has been a perceptible falling off in the number of new electrical devices and appliances placed on the market. Of the small material that is used in connection with wiring practice has this been most evident. Of the latter class the falling off in new materials has been probably around 40 per cent. In view of the fact that up to this time there has been always an increasing amount of new materials and supplies placed on the market this present situation is significant both with respect to the present and to the past.

Right now manufacturers are not placing new materials on the market faster for perhaps two reasons: First, they haven't the time, and second, the demand for goods now on the market is so great as to make it unnecessary to go to the extra expense of marketing a new product. Furthermore, it is doubtful if under the present industrial tension it would be possible to give to a host of new products the necessary manufacturing facilities.

With industrial activity beyond all former bounds the necessity for new products is not great. Competition begets progress and development, and certain it is that now there is plenty of business for everyone. Since the crying need at present is quick delivery, in many cases almost regardless of price, there is not the incentive of normal times to make new products which can be sold at a smaller price.

Labor Unrest Growing

Latest information from Pittsburgh states that the Westinghouse strikers are now in a mood for mediation. Following the disturbances of Tuesday the works are in the hands of the military under orders from Governor Brumbaugh, and the strikers have receded from their position by asking Patrick Gilday of the Department of Mediation and Conciliation at Washington to arrange a meeting with President Herr of the Westinghouse interests.

The men want an eight-hour day or forty-eight-hour week at the same wages paid for the fifty-six-hour week. The Westinghouse interests are known to have definitely decided not to give an eight-hour day at present.

The general labor situation is at present in as precarious position as it has been for some time. Dissension and unrest are spreading, and no center that has any great industrial activity is free from it. Capital is viewing the situation with considerable apprehension and, as daily happenings show, is willing to satisfy almost the last demand in order to keep the men at work.

Wages are higher now than they ever have been, and labor apparently for the most part is in absolute control. Organized labor, in fact, views the present as its day. Factories are rushed with orders and prices for goods are known to be higher. Reports of enormous profits accompanied contracts for munitions of war. Labor at last, and all that could be had, was necessary. The natural impulse was to take advantage of these conditions and make the most out of them.

Up to now most of the demands of the men have been met promptly, and in a large number of instances were anticipated. The additional wages paid have not always been of a nature that would assure their permanence, but the men have for the moment received larger pay checks.

All of this, however, has not checked the undercurrent of unrest and dissatisfaction. Ever since the government set the eight-hour standard labor has yearned for the shorter working day. It has always been uppermost in the men's minds. Consequently, now that what is believed to be the right time to strike the blow is here, labor agitators and leaders will not let the men pass it by.

Wages are high, yes, but they may not last. An eight-hour day, however, is permanent. Once it is started it will never be lengthened. That is the popular belief, and for that reason labor is inclined to forget the recent advance in wages.

Another side to the labor situation that is just about as serious as the higher wages and unrest is the great lack of labor. Labor is scarce, so scarce, in fact, that unskilled labor is being offered skilled labor jobs. Immigrants are receiving unheard-of wages. Bonuses are being paid to labor if it will stay for a certain definite time. Every effort is being made to retain labor.

Export Situation

Exports of goods of American manufacture from the port of New York during the third week in April while not as large as for the two preceding weeks were considerably greater than during the corresponding weeks of both 1915 and 1914. Compilations made by the foreign trade department of the National City Bank of New York place the exports for this port during the week ended April 22, at $37,673,367, in comparison with $24,312,996 and $18,373,263 for the corresponding weeks of 1915 and 1914 respectively.

England received the largest amount of goods of any nation to which the American goods are exported—namely, $18,574,143 in comparison with the exports of corresponding weeks of previous years of $5,801,716 in 1915 and $4,834,735 in 1914. The exports to France showed a slight falling off. For the third week in April last they amounted to $5,311,334 in comparison with $6,490,662 for the third week in April, 1915, and to $1,167,734 for the third week in April, 1914. A more marked falling off is noted in the exports to Italy. During the third week in April, 1914, these exports amounted to $633,396; for the corresponding week in 1915 they had risen to $3,402,558, while for the corresponding week in last April they had fallen to $1,295,616. No goods left the port of New York during the third week in April of this year for Austria-Hungary, Belgium, Germany or Portugal.

South and Central America continue to take more American goods than during corresponding periods of the two previous years. For the week ended April 22, 1915, the exports to South America from the port of New York were $1,972,210 in comparison with the third week in April for the two previous years, 1915 and 1914, respectively, of $1,084,659 and $1,640,630, while to the Latin countries of North America, namely, Cuba, Hayti, Panama, Mexico and Santo Domingo for these three periods the exports were $2,552,115, $1,206,879 and $1,498,812.

A survey of the principal increases in exports shows explosives to be in the lead. During the corresponding period of 1914 very little of these materials was exported. Other very appreciable increases in exports were for automobiles, copper of all kinds, chemicals, engines and parts, manufactures of brass and metal working machinery. It is also noted, strangely enough, that almost twice as many motion picture films were exported in the third week of April, 1916 as in the corresponding week of 1914.

There were decidedly smaller exports in agricultural machinery, mining machinery, typewriters and what is hardly to be expected owing to large exports of automobiles, lubricating petrol and naphtha.

The exports of copper wire during the third week in April, 1916, amounted to $87,267 in comparison with $22,784 during the corresponding week of 1914. Exports of electrical machinery during the week ended April 22, 1916, were $104,579, and for the similar week in 1914 were $21,237.

Western Conduit Employees Get 10 Per Cent Salary Increase

The Youngstown Sheet & Tube Company recently issued the following notice to its 10 000 employees, among whom are the employees of the subsidiary company, the Western Conduit Company: "Effective May 1, in lieu of profit sharing and as an advance in wages, we will pay all employees (except salaried employees) an extra 10 per cent of their earnings each pay period. This will be paid by a separate check with the regular pay or as soon thereafter as possible. This arrangement will be in effect for the balance of the year 1916 if present business conditions continue. The war abroad has brought about unusual conditions in all lines of business and this advance is made in recognition of this. Profit sharing for the first four months of the year will also be paid in the usual way to our employees at the end of the year, if the year's profits warrant such payment."

Manufacturing and Industrial

The Wagner Electric Manufacuring Company, St. Louis, Mo., has moved its Denver office to 1633 Tremont Street, which will remain in charge of O. H. Davidson.

Large Volume of Boiler Orders—The Babcock & Wilcox Company, manufacturer of water-tube steam boilers, reports that it is exceedingly busy at present and that the volume of orders is very large.

The Doehler Die-Casting Company, Court Street and Ninth Street, Brooklyn, N. Y., has acquired a controlling interest in the American Die Casting Company of Newark, N. J., which will hereafter be known as the Doehler Die-Casting Company of New Jersey.

E. I. Van Doren, 332 River Street, Troy, N. Y., manufacturers' agent, has opened a branch office at Room 401, Dolan Building, Albany, N. Y., where he will sell a general line of Wagner single-phase motors, Lincoln polyphase motors, and act as jobbers for Buckeye Mazda lamps. He will also sell the Van Doren system of individual factory lighting units for lighting of sewing machines and all classes of individual work.

Allis-Chalmers Company to Increase Wages.—On April 27 the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., announced that the wages of its 12,000 employees would be increased from 10 to 12 per cent. In this increase the company is making the provision that the amount of the increase will be gaged by the individual working value of the man as determined by recent tests made without the knowledge of the men. The increase takes effect on May 1.

New Building for Fort Wayne Works of General Electric Company.—A new building, it is announced, which will be five stories high and occupy a plot 400 ft. by 75 ft., will be added to the plant of the Fort Wayne department of the General Electric Company in the near future. This building will be in addition to one which is already under construction. Each of these two structures will be larger than any of the present buildings of the General Electric Company at Fort Wayne.

The Standard Underground Cable Company, Pittsburgh, Pa., has moved to its Chicago office from the Rookery to the Conway Building, and its Detroit office from the Free Press Building to the Whitney Building. The company will open a new office in the near future in Minneapolis, Minn., which will be in charge of W. J. Weld. In the Pacific Coast department the Portland, Ore., office has been discontinued and a new office has been opened in the Newhouse Building, Salt Lake City, Utah, which is in charge of F. W. Wilson.

Large Order for Radio Equipment.—The Federal Telegraph Company has secured contracts for wireless equipment in the new government stations at Pearl Harbor, Cavite and San Diego. These plants, it is reported, will have the largest capacity of any yet installed. The first plant to be completed will be that at San Diego on which contracts call for delivery next October. The radio equipment is being built at the Palo Alto (Cal.) plant of the Federal Telegraph Company under the direction of Chief Engineer Leonard F. Fuller.

L. N. Pyle has resigned as sales manager of the Detroit Fuse & Manufacturing Company to accept a position as assistant general manager of Edmunds & Jones Manufacturing Company of Detroit. The Edmunds & Jones Manufuring Company are makers of automobile lamps and automobile accessories. Prior to his connection with the Detroit Fuse & Manufacturing Company, Mr. Pyle for a number of years was manager of the lamp department of the Westinghouse Electric & Manufacturing Company, both at Detroit and at Chicago.

Fire Destroys Delta Electric Company Factory.—A fire supposed to have started from an overheated furnace destroyed the East Third Street factory of the Delta Electric Company at Marion, Ind. The damage, which amounted to between $20,000 and $30,000, was covered by insurance. Valuable dies and drawings belonging to the company were locked in the fireproof safe and were not damaged. It is reported that the company has four warehouses full of its portable electric flash lamps and other products which can be used in filling immediate orders and in tiding the company over until its new factory can be erected on a site which has been purchased at Marion.

Orders for Electric Clocks.—The Betts & Betts Corporation, 256 West Fifty-fifth Street, New York, is building a 20-ft. self-winding "Elektrik Klok" for the new Circle Theater in Indianapolis. The clock will be installed by the Sanborn Electric Company of Indianapolis. In addition to the clock, which will have electric hands, numerals and minute marks, there will also be an attractive electric sign which will be equipped with a Betts & Betts special flasher and several hundred color caps. The Betts & Betts Corporation has also received orders the past month for electrically operated clocks which will be installed in Syracuse, Providence, Boston and Lancaster, Pa.

Electrical Exhibits at Boston Textile Show.—Several electrical exhibits were features of the textile show held at Boston, Mass., last week in connection with the semi-annual convention of the National Association of Cotton Manufacturers. The General Electric Company showed for the first time several examples of textile motors of new design and some oil switches. The Westinghouse Electric & Manufacturing Company displayed several textile motors and suspensions of late design, and featured an interesting exhibit of good and poor illumination for industrial service. The Graton & Knight Manufacturing Company, Worcester, Mass., showed a new "multiple-unit" motor drive for looms. The Edison Storage Battery Company, Orange, N. J., showed the new Type G cell for high-rate discharge and charge service and industrial electric truck batteries.

The Copper-Clad Steel Company, of Pittsburgh, Pa., recently incorporated under the laws of Pennsylvania, has erected a plant at Rankin, Pa., for the purpose of manufacturing "copper-clad" steel products. The mills are of modern construction and are electrically operated throughout. Jacob M. Roth, president, and Julius W. Reisz, engineer of the company, have discovered a process of welding copper with steel or iron, producing a perfect weld, it is asserted, without voids and with a uniform conductivity throughout. The steel is placed into a patented mold and this mold is then placed into a specially constructed furnace. The steel undergoes a special heat treatment which produces a perfect weld and at the same time increases the tensile strength, it is claimed, of the steel 30 per cent, and makes the elastic limit 60 per cent higher. This "Copperweld" wire, as it is called, has a tensile strength about 60 per cent greater than that of hard-drawn copper of the same size, it is pointed out, and will stand approximately 40 per cent more strain than copper before reaching its elastic limit. This makes possible the use of at least two sizes smaller wire than when hard-drawn copper is used for the same purpose, it is declared, and therefore, exposes less surface area to storms, insuring continuity of service under severe weather conditions. In comparison with copper wire of the same gage the wire weighs about 7 per cent less.

Recent Orders for Westinghouse Equipment.—The Buffalo General Electric Company has purchased from the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., complete switching equipment to control three 20,000-kw. turbo-generator units and auxiliary apparatus in its river station at Buffalo, N. Y. Among recent orders for turbines of large rating received by the Westinghouse company is one from the Narragansett Electric & Lighting Company, of South Providence, R. I., for one 45,000-kw. turbo-generator unit with condensers and auxiliary apparatus. The last-named concern has also bought one 2500-kw. synchronous booster rotary converter with transformers and switchboard equipment. The Westinghouse Electric & Manufacturing Company has also sold to the Commonwealth Edison Company of Chicago two 4000-kw., 25-cycle rotary converters for railway work, two 4400-kw., 60-cycle synchronous booster rotary converters for lighting service and two 4200-kva., three-phase transformers, rated at 12,000 volts on the high-tension side and being a combination of water-cooled and self-cooled apparatus built according to designs made by the engineers of the Commonwealth Edison Company. On this order there were also one 2000-kw., 60-cycle, synchronous booster rotary converter, one 2200-kva., transformer and current-limiting reactors for generator and feeder leads. Another order has been received from the Public Service Company

of Northern Illinois, for its Branden Bridge power plant at Joliet, Ill., for three 3000-kva., single-phase transformers, two 9000-kva. three-phase transformers, and a complete power-house switchboard to control one 10,000-kw. turbo-generator unit and transformers and feeders. Other recent orders for Westinghouse apparatus include sixteen 5-ton Baldwin-Westinghouse gathering locomotives for the Leckie Fire Creek Coal Company of Bluefield, W. Va., and two 1500-kw. turbo-generator units, complete with condensers, one 500-kw. turbo-generator unit with condensers and one 50-kw. turbo-generator to be installed in the Calumet Terminal Building of the Chicago & Northwestern Railway Company at Chicago, Ill., and to be used in operating one of the largest grain elevators in the world.

NEW YORK METAL MARKET PRICES

	April 25 Selling Prices Bid	Asked	May 2 Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	131 0 0		134 0 0	
Prime Lake	29.50	to 30.00†	29.50	to 30.00†
Electrolytic	30.00	to 31.00†	30.00	to 31.00†
Casting	27.50	to 28.00†	27.50	to 28.00†
Copper wire base	32.50	to 33.50†	32.50	to 33.50†
Lead	7.50		7.50†	
Nickel	45.00	to 50.00	45.00	to 50.00
Sheet zinc, f.o.b. smelter	25.50†		25.50†	
Spelter, spot	18.17½	to 18.42½†	17.55	to 17.80†
Tin, straits	49.50†		51.50†	
Aluminum, 98 to 99 per cent.	57.00	to 59.00†	57.00	to 59.00†

OLD METALS

Heavy copper and wire	23.00	to 23.50†	24.00	to 24.25†
Brass, heavy	14.75	to 15.25†	14.75	to 15.00†
Brass, light	11.75	to 12.00†	11.75	to 12.00†
Lead, heavy	6.40	to 6.62½†	6.00	to 6.25†
Zinc, new scrap	16.00	to 17.00†	15.00	to 15.50†

COPPER EXPORTS

Total tons to May 2 881

†Nominal.

Corporate and Financial

Binghamton (N. Y.) Light, Heat & Power Company.—An issue of $500,000 of first refunding mortgage 5 per cent gold bonds, due Feb. 1, 1946, is being offered at a price to yield about 5.05 per cent.

Consolidated Light & Power Company, Mount Pleasant, Mich.—The Detroit Trust Company, receiver for the Consolidated Light & Power Company and the Chippewa Construction Company, which are organized for the purposes of constructing certain of the company's properties, has announced that it proposes to sell the assets of both of the companies at public auction in Detroit on May 16.

Dayton (Ohio) Power & Light Company.—The public utilities commission of Ohio has authorized the company to issue $1,250,000 of its first and refunding mortgage 5 per cent gold bonds dated June 1, 1911, at not less than 91. The proceeds will be devoted to the construction and equipment of a new power plant at Miller's Ford, Dayton.

Northern Iowa Gas & Electric Company, Humboldt, Iowa.—The unsold portion of $500,000 of the company's first mortgage 6 per cent sinking fund gold bonds due Jan. 1, 1934, is being offered at 101 and interest.

Pacific Light & Power Company, Los Angeles, Cal.—An issue of $1,100,000 of first (closed) mortgage 5 per cent bonds due July 1, 1942, is being offered at 99 and interest.

San Diego (Cal.) Consolidated Gas and Electric Company.—The California Railroad Commission has authorized the company to issue $144,000 of 7 per cent preferred stock at not less than par. The money is to pay promissory notes for $30,000 and to reimburse the company's treasury for expenditures for extensions, additions and betterments of $114,000. The company applied to the commission for authority for this issue of stock and also permission to increase its authorized capital stock from $3,500,000 to $6,000,000. The commission said that its consent is not necessary to the filing of articles of incorporation showing the increased authorized common stock, but only to the issue of capital stock. In the original application, before amended, the company wanted to issue $500,000 of the preferred stock and to use $356,000 of that amount to pay ten-year 6 per cent debentures due Dec. 1, 1922. Of these debentures $106,000 were issued during 1913 at 95 and accrued interest, and $250,000 during 1915 at 93. The company concluded later not to retire these debentures at this time, and the amended application asks only for the issue of preferred stock herein granted.

Schenectady (N. Y.) Illuminating Company.—The company has been authorized by the Public Service Commission, Second District of New York, to issue $886,000 of its common stock, and the Mohawk Gas Company of Schenectady has been authorized to issue $870,000 of its stock for the refunding of notes and other indebtednesses of the two companies. Both issues must be sold at not less than par, and both authorizations are accompanied by provisions which will compel the companies to bring their accounts into accord with the commission's uniform systems. In the case of the Illuminating company the commission has approved the company's plan for amortizing at $50,000 a year one-half of the sum of $1,462,113.43 which is now carried as a balance in one of the company's capital accounts. Other minor changes are also required in the company's accounting. Of the proceeds of the present issue of stock $270,000 will be applied to the payment of the balance of notes standing since 1912, $295,000 will be paid for the discharge of accounts and interest, and $320,000 will be paid into the treasury of the company to reimburse it for money expended for capital assets. Five hundred and seven thousand dollars of the Mohawk Gas Company's proceeds of the stock sale will be used for the payment of notes and accounts and $362,000 for the reimbursement of the treasury for capital purposes.

Seneca Power Corporation, Seneca Falls, N. Y.—The Public Service Commission for the Second District of New York has made an order providing for the financing of the $2,000,000 hydroelectric development on the Seneca Outlet at Seneca Falls through the Seneca Power Corporation, the Central New York Gas & Electric Company and the Empire Coke Company, made possible by the settlement in the Court of Claims of the water-power rights of a large number of mill owners in Seneca Falls, who pooled their interests and are now turning the new development made necessary by the barge canal over to the Seneca Power Corporation. Through this enterprise 20,000,000 kw.-hr. annually will eventually be made available. The Seneca Power Corporation will increase its stock from $5,000 to $1,250,000. This latter amount of stock it is now authorized to sell at not less than par. The proceeds will be paid to a committee of the Seneca Falls power owners, for all the available rights, set aside by the Court of Claims decision, from the water not necessary for the operation of the barge canal, and $53,000 of the proceeds, plus $185,000 of the proceeds of an issue of $450,000 6 per cent bonds also authorized for the Seneca Power Corporation, will be paid to the Seneca Falls Woolen Company and the Ivory Button Company for their share in these water-power rights. In its order, however, the commission expressly states that the issue of these securities for the payment for these water rights will not preclude the commission from investigating the value of these rights and assigning them a different value in any case which may hereafter arise in connection with the rates charged for the power thus to be developed. The balance of the proceeds of the issue of Seneca Power bonds, which must be sold at not less than 94 to net in all $423,000, will be used toward paying $290,000 for the erection of the company's plant and for the large expenses of the litigation in the Court of Claims and other organization expenses, including mortgage and internal revenue taxes. The commission also authorizes the Central New York Gas & Electric Company to lease and operate the Seneca Power plant. The Central New York company will acquire $150,000 of the Seneca Power stock, which it is authorized to pass on to the Empire Coke Company, both transfers at par. The latter company is authorized to issue $150,000 of its 6 per cent collateral trust bonds at 93, netting $139,500, to go toward the purchase of this stock. The Central New York company guarantees the principal and interest of the Seneca Power bonds and the Empire Coke Company in turn guarantees the payment of the Central New York's rental to the Seneca Power

Corporation. The Central New York Company, with demands on its present generating power that it can meet neither through its own stations nor through purchase of Niagara power, has contracted to purchase the entire output at 0.75 cent per kilowatt-hour. This power will be distributed throughout the Central New York's territory along the Auburn Road and as far east as the great Remington plants at Ilion.

Salmon River Power Company, Buffalo, N. Y.—The Public Service Commission for the Second District of New York has authorized issues of securities aggregating $1,097,275 by the Salmon River Power Company for the purchase and improvement of the Lyons power plant of the Niagara, Lockport & Ontario Power Company, pursuant to an agreement between the Niagara, Lockport & Ontario and the Rochester, Syracuse & Eastern Railroad Company. The transaction is made dependent on strict allowances for depreciation prescribed by the commission. The Niagara, Lockport & Ontario Company is authorized to acquire 1956 shares of the Salmon River stock at par for $195,600 and the commission approves the guarantee by the former company of the punctual payment, interest and principal, of all of the bonds of the Salmon River Company and its predecessors, involving issues totaling $3,345,000. The price to be paid for the Lyons plant, less depreciation, is $612,907. To the plant will be added a 10,000-kw. turbo-generator, including buildings, boilers and accessories of the most modern type, at a cost of $484,360. The securities authorized to be issued are $195,600 common stock at par, $62,300 two-year 6 per cent, unsecured notes at par, and $987,500 of 5 per cent first mortgage bonds at 85 to net $839,375.

New Utility and Industrial Companies

The U. N. D. Electric Company of Akron, Ohio, has been incorporated with a capital stock of $15,000 by F. A. Dussel, H. F. Uhl, William Dussel and William Woodbridge.

The Dayton Storage Battery Company of Dayton, Ohio, has been chartered with a capital stock of $10,000 by Roy M. Robeson, Crist A. Lesh, H. P. Williamson, J. I. Robeson and I. I. Hauer.

The Radcliffe Electric Company of Newport News, Va., has been chartered with a capital stock of $15,000. The officers are: W. H. Radcliffe, president, and W. L. Cooke, secretary, both of Newport News.

The Windmere Electrical Construction & Fixture Company of East Cleveland, Ohio, has been incorporated with a capital stock of $6,500 by A. C. Day, A. L. Keifer, C. A. Metzger, S. C. Crobaugh and Karl Germain.

The Eureka Electric Sign Company of Jersey City, N. J., has been incorporated by Charles J. Gormley, John H. Paterson and Benjamin E. Gordon, all of Jersey City, N. J. The company is capitalized at $100,000 and proposes to manufacture electric signs.

The Smith Lighting Company of Rochester, N. Y., has been incorporated with a capital stock of $15,000 to install lighting systems (both gas and electric). The incorporators are: L. F. Magnono, W. F. Smith, A. W. Chaddock, 45 Enterprise Street, Rochester, N. Y.

The Coleman Animated Sign Corporation of New York, N. Y., has been incorporated with a capital stock of $200,000 to manufacture and deal in electric signs, boards, etc. The incorporators are: George S. Coleman, William S. Creevey, Robert A. Greason, all of New York, N. Y.

The Triangle Conduit Company of New York, N. Y., has been incorporated with a capital stock of $30,000 to manufacture electrical and gas conduits. The incorporators are: F. W. Russell, 8834 Bay Ninth Street, Brooklyn; J. M. Edelson, 695 Nicholas Avenue; G. W. Wittson, 601 West 115th Street, New York, N. Y.

The World Lighting Appliance Company of New York, N. Y., has been incorporated with a capital stock of $15,000 by Samuel H. Shaminsky, Leon Mayer and Jacob M. Goodstein, of New York, N. Y. The company proposes to manufacture and deal in gas and electric lighting and heating fixtures and supplies.

Trade Publications

Ornamental Lighting Fixtures.—The Glen Tor Studio, Nyack, N. Y., has issued an illustrated brochure descriptive of several types of pottery lighting fixtures.

Electrical Supplies.—Catalog No. 6111, issued by Hibbard, Spencer, Bartlett & Company, Chicago, Ill., lists a number of different types of electrical appliances.

Magnetic Rectifier.—The France Manufacturing Company, Cleveland, Ohio, has issued an illustrated folder containing information on its magnetic battery charging device.

Small Electrically Operated Pumps.—The Bishop-Babcock-Becker Company, Cleveland, Ohio, has issued several illustrated bulletins on its automatic electric beer pump.

Hickey and Crow Feet.—The Jorsch Electric Manufacturing Company, Janesville, Wis., has prepared an illustrated bulletin on its hickey and several types of crowfeet.

Street Lighting Units.—Catalog Y-785, issued by the General Electric Company, Schenectady, N. Y., is entitled, "Novalux Street Lighting Units for Mazda Series Lamps."

Metal Boxes.—The Pratt Chuck Company, Frankfort, N. Y., has issued an illustrated catalog containing information on outlet, switch and junction boxes, covers and fittings.

Wireless Condensers.—The Wireless Improvement Company, 81 New Street, New York, has issued an illustrated bulletin with information on "Dubilier" mica condensers.

Flood-Lighting Equipment.—The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill., is sending out an attractively illustrated bulletin on its flood-lighting units.

Panels.—Types DD, DK, DR and DP narrow panels and revised listings of Types O and P panels are the subject of Bulletin No. 1C, recently issued by the Crouse-Hinds Company, Syracuse, N. Y.

Automatic Switch for Charging Panels.—The Hartman Electrical Manufacturing Company, Mansfield, Ohio, has just issued Bulletin No. 14, descriptive of its automatic switch for charging panels.

Inclosed Switches.—The Trumbull Electric Manufacturing Company, Plainville, Conn., has issued an illustrated leaflet which contains information on its "Circle T" No. 701 combination switches in safety boxes.

Pole-Top Switches.—The Royal Electric Manufacturing Company, Inc., 556 East Fortieth Street, Chicago, has issued a thirty-two-page illustrated catalog describing Royal trolley pole-top switches for high-tension service.

Electric Paring Machines.—The Imperial Machine Company, 108 West Thirty-fourth Street, New York, has issued an illustrated folder which contains information on several types of motor-driven vegetable-paring machines.

Electrically Operated Centrifugal Pumps.—Bulletin No. 120, descriptive of various types of electrically operated multi-stage centrifugal pumps, has been issued by the Goulds Manufacturing Company, Seneca Falls, N. Y.

Small Electric Air Compressors.—The Brunner Manufacturing Company, Utica, N. Y., has issued Catalog No. 13 on its small belt-driven and motor-driven air compressors and a booklet entitled "Garageman's Handbook on Compressed Air."

Electric Air Compressors.—The United States Air Compressor Company, Cleveland, Ohio, has just issued Catalog No. 15, which is illustrated and which is descriptive of electrically operated two-stage air compressors, some of which are portable.

Under-Feed Stokers.—The Jones Under-Feed Stoker Company of America, Harris Trust Building, Chicago, has issued an illustrated thirty-two-page catalog showing installations of its mechanical underfeed stokers in both large and small power plants.

Electric Paring Machines.—The American Machinery Company, 1225 Callowhill Street, Philadelphia, Pa., has issued several illustrated bulletins which describe various types of electrically operated vegetable-paring machines. The company has also issued a folder containing a long list of users of these machines.

New England

LISBON, ME.—A committee has been appointed by the town of Lisbon to secure information relative to the establishment of a municipal electric-light plant.

MARS HILL, ME.—The Westfield Electric Company, recently organized with a capital stock of $10,000 has been granted permission to operate an electric-light plant in Mars Hill. R. J. Colbath of Mars Hill is president.

PRESQUE ISLE, ME.—The Maine & New Brunswick Electric Power Company of Presque Isle expects to install new racks in canal at Aroostook Falls this year. C. O. Austin is superintendent.

RUMFORD, ME.—Preparations are being made by the Rumford Falls Power Company for the construction of a new power station 200 ft. by 70 ft., three stories high. The southern portion of the present building will be removed. Two penstocks will be replaced by a canal, 100 ft. wide and 20 ft. deep. The present dam (wooden crib) will be replaced by a new concrete dam, which will be placed nearer the falls. Contracts have been placed for two new 11,000-volt generators, each rated at 8000 kw.

BRANDON, VT.—The Hortonia Power Company is planning to install a new lighting system in Brandon.

BROCKTON, MASS.—The Edison Electric Illuminating Company of Brockton will soon erect a new substation, at a cost of about $100,000, in Brockton. The existing substation, which is equipped for alternating and direct-current service will be used entirely for direct-current service upon completion of the new station, which will be equipped for alternating-current service. The new building will be designed for an ultimate capacity of 9000 kw., the present transformer equipment to be installed totaling 3500 kw. The output of the direct-current substation will be increased by the addition of a 750-kw. motor-generator set. Improvements will be made to the East Bridgewater generating plant, including the installation of a 10,000-kw. General Electric turbo-generator set, two 600-hp. Edgemoor boilers, equipped with Taylor automatic stokers, Wheeler Condensing & Engineering Company's condensing apparatus and switchboard equipment. The Stone & Webster Engineering Corporation of Boston has the contract for the work.

CHICOPEE, MASS.—An ordinance has been introduced in the City Council appropriating $45,000 for improvements to the municipal electric-lighting plant.

CONWAY, MASS.—The Greenfield Electric Light & Power Company has submitted a proposition to take over the local electric plant owned by the Deerfield River Electric Light Company. The Greenfield company proposes to rebuild the local system at a cost of from $20,000 to $25,000 and to establish a 24-hour service.

WEST NEWBURY, MASS.—Bids will be received by the Selectmen of West Newbury until May 10 for wiring and fixtures for electric lighting of the town hall, library building and engine house. Plans and specifications may be seen at the town office in the town hall. Perker H. Nason is secretary.

NEW HAVEN, CONN.—Arrangements have been made by the trustees of the Connecticut Company for doubling the output of the Grand Avenue power house. A 10,000-kw. turbo-generator has been purchased.

Middle Atlantic

BUFFALO, N. Y.—The Public Service Commission has authorized the Salmon River Power Company of Buffalo to purchase the Lyons power plant of the Niagara, Lockport & Ontario Power Company, at $612,907. Improvements will be made to the plant, including the installation of a 10,000-kw. turbo-generator, boilers and accessories, etc., at a cost of $484,360.

BUFFALO, N. Y.—The Buffalo General Electric Company is planning to begin work at once on the construction of the conduit system in connection with its large electric generating plant in Tonawanda, now under construction. The meet the present needs 30 ducts will be required. The underground line will be about 2 1-5 miles long, extending from the new power plant on the Niagara River to the transformer station just over the city line in Buffalo.

COHOES, N. Y.—Plans are being considered for the installation of an ornamental street-lighting system on Remsen Street.

EAST AURORA, N. Y.—At a special election held April 24 the proposal to install a new lighting system on Main Street, at a cost not to exceed $6,000, was carried.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

Work will begin at once on the installation of the system.

ESSEX, N. Y.—The Public Service Commission has granted the Boquet Electric Company of Essex permission to issue $10,000 in capital stock.

GARDEN CITY, N. Y.—The Garden City Company is installing Girtman-Davis ash-handling equipment at its electric plant. H. Hatch is superintendent.

ROCHESTER, N. Y.—Preliminary work has begun by the Rochester Railway & Light Company on the construction of a large hydroelectric power development. The work will include the construction of a large horseshoe tunnel from the dam above the Middle Fals under the river to the eastern base of the Lower Falls, a distance of 1550 feet. The cost of the work is estimated at $750,000. The tunnel will result in the elimination of station 15 on the west bank of the river at Middle Falls and station 5 on the east bank at the foot of the Lower Falls. A new power house, 130 ft. by 70 ft., will be erected at the Lower Falls, where station 5 now stands. The turbines of 16,000 hp. each will be installed. A third turbine of the same capacity will be installed later.

SENECA FALLS, N. Y.—Arrangements have practically been completed for financing the hydroelectric development on the Seneca outlet at Seneca Falls through the Seneca Power Corporation. The cost of the new power plant and transmission lines is estimated at $2,000,000. The commission has authorized the Central New York Gas & Electric Company to lease and operate the Seneca power plant. Electricity generated at the plant will be distributed throughout the Central New York's territory along the Auburn Road and as far west as the Remington plants at Ilion.

CATASAUQUA, PA.—The Town Council has passed an ordinance (which will be submitted to the voters on May 16), increasing the borough debt $50,000 for the purpose of building a municipal electric-light plant.

HAZLETON, PA.—The Harwood Electric Company of Hazleton is contemplating extending its transmission lines to Sunbury and Frackville.

MEADVILLE, PA.—An election will be held May 16 to submit to the voters the proposal to issue $10,000 in bonds for extensions and improvements to the municipal electric plant.

WILKES-BARRE, PA.—Contracts will soon be awarded by George S. Welsh, architect, Coal Exchange, Wilkes-Barre, for the construction of a silk mill and power house in Wilkes-Barre for the Duplan Silk Company, Fourth Avenue and Seventeenth Street, New York, N. Y. Estimates for wiring and heating will be received later.

PAULSBORO, N. J.—Bonds to the amount of $10,000 have been voted for the installation of a municipal electric-light plant in Paulsboro.

BALTIMORE, MD.—Bids will be received by the State Roads Commission, 601 Garrett Building, Baltimore, until May 23 for lighting Hanover Street Bridge and approaches, including all necessary transformers, switchboards and attachments, wiring, poles, fixtures, lamps, globes, etc., for 1½ miles of street and bridge lighting. For details see proposal columns.

GLENVILLE, W. VA.—Bids will be received by the County Court of Gilmer County, care of N. E. Rymer, clerk, Glenville, until May 23 for construction of courthouse, jail and sheriff's residence in the town of Glenville. Separate bids to be submitted on heating, plumbing and electrical work for all buildings. Copies of plans and specifications may be obtained upon applications to N. E. Rymer, clerk. Holmboe & Lafferty of Clarksburg are architects.

MOUNT HOPE, W. VA.—The Mount Hope Electric Power & Water Company has applied for a franchise to install and operate an electric-light plant and waterworks system.

RICHMOND, VA.—The city of Richmond is contemplating a $2,000,000 bond issue, of which the proceeds of $50,000 will be used for the installation of a municipal electric-light plant.

WINCHESTER, VA.—The City Council has awarded the Northern Virginia Power Company of Winchester a contract to light the streets of the city with nitrogen-filled lamps. The company will also supply electricity to maintain the ornamental lighting system to be installed soon. The city has abandoned the project to install a municipal electric plant.

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia, District Building, Washington, D. C., until May 10 for furnishing six bronze lamp posts. Specifications and form of proposal may be obtained from the purchasing officer, Room 320, District Building.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, Washington, D. C., until May 10, under proposal No. 802 for furnishing 41,250 ft. cable, type 327; 50-pair No. 19 B. & S. gage, paper-insulated, lead-covered and armored cable; also cable type 351, one pair rubber-insulated, lead-covered, with galvanized flexible armor in lots of $150,000 250,000 ft. For further information address Charles S. Wallace, captain signal corps, United States Army.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y., Schedule 9587—250 lenses for air ports and deck lights; Schedule 9590—miscellaneous inclosed fuses, inclosed type, 6000 lamp sockets; Schedule 9568—one electric welding apparatus. Washington, D. C., Schedule 9592—50 dozen glass tubes for Hart's condenser. Boston, Mass., Schedule 9569—miscellaneous seizing wire. Mare Island, Cal., Schedule 9598—232 W. T. and N. W. T. vibrating bells, miscellaneous renewable inclosed fuses, 86 electric soldering irons, miscellaneous plugs attachment, etc., miscellaneous hard rod rubber; Schedule 9584—one motor truck. Philadelphia, Pa., Schedule 9587—26,000 sq. ft. compressed sheet cork. Puget Sound, Wash., Schedule 9598—20,000 glass tube fuses, 60 lb. uncut mica, five ¼-hp. ventilating sets. Ostrich Bay, Puget Sound, Wash., Schedule 9577—one electric locomotive. Norfolk, Va., Schedule 9591—miscellaneous switches; Schedule 9583—two engine order telegraphs. Charleston, S. C., Schedule 9606—600 ft. lead tubing, 600 ft. steel tubing. Philadelphia, Pa., and Norfolk, Va., Schedule 9568—two electric welding and cutting outfits. Applications for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Commerce reports as follows: No. 20,852—An American consular officer in New Zealand reports that a firm in his district desires to represent American manufacturers of builders' hardware, bathtubs and plumbing supplies, gas and electric fixtures, etc. No. 20,884—An American consular officer in Italy writes that a firm in his district desires to communicate with American manufacturers of electric dry batteries. Correspondence may be in English. No. 20,905—An American consular officer in an insular possession reports that a man in his district desires to receive quotations, catalogs and full information from American manufacturers of wiring materials and points, insulating materials, electrical fixtures and incandescent lamps. The man desires to act as general agent. Correspondence should be in Spanish. No. 20,906—A commercial agent of the bureau writes that a firm in the United States has received inquiries from its agent in Japan for tungsten filaments suitable for 10, 16 and 25-cp. electric bulbs. No. 20,907—A commercial agent of the bureau reports that a man in France desires to represent American manufacturers at the coming reconstruction exhibition and to arrange for permanent representation thereafter. Correspondence should be addressed to the man's associate in the United States. No. 20,929—A commercial organization in the United States writes that a European iron and steel merchant has formed a partnership with an American citizen and desires to obtain exclusive agencies from American manufacturers of railway cars and supplies, automobiles and accessories, tools, bolts, marine engines, flour and elevator machinery and steel rails. Agencies are desired for Belgium and the Netherlands. No. 20,946—A man in Spain informs an American consular officer that he desires to communicate with American manufacturers of automatic electric pianos, especially those with slots for coins. No. 20,948—A firm in South Africa informs an American consular officer that it desires to purchase electrical supplies from the United States. No. 20,954—An American consular officer in South Africa writes that a firm in his district desires to receive catalogs and quotations f.o.b. New York, from American manufacturers of motor-driven machinery for making rectangular soldered-top cans for corned beef and ox tongues, having a daily capacity of 5000

cans, etc. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or its branches.

North Central

EAST LANSING, MICH.—Bids will be received at the office of Edwyn A. Boyd, architect, Lansing, until May 16 for construction of high school building at East Lansing. Separate bids to be submitted on general construction, plumbing, heating and electric wiring.

HILLSDALE, MICH.—The Council has engaged A. H. Lovell of the University of Michigan to examine the water power of the village with a view to determine its availability for developing electrical power. If the report proves satisfactory a new municipal electric plant is contemplated.

BELPRE, OHIO.—The Council has accepted the proposal of the Kanawha Traction & Electric Company of Wheeling, W. Va., for lighting the streets of the town with nitrogen-filled lamps. The contract provides for about 50 lamps of 100 cp.

CINCINNATI, OHIO.—A bond issue of $8,038,050 has been approved by the voters. Of the proceeds $6,000,000 will be used for rapid transit, $400,000 for high-pressure system, and the remainder for street improvements.

CINCINNATI, OHIO.—The City Council has granted the Westend Rapid Transit Company a franchise for an electric railway from Anderson's Ferry to the city, a distance of 7 miles. This line will serve as an entrance for the Cincinnati, Lawrenceburg & Aurora Traction Company's line, which is being promoted by the same interests. The proposed new railway will cost about $800,000. Construction work will begin about Sept. 1.

COLUMBUS, OHIO.—Preparations are being made by the Columbus Railway, Power & Light Company for the erection of a new power plant on Kimball Street, near Broad Street, on Scioto River in Columbus, at the cost of about $375,000.

MANSFIELD, OHIO. — Extensive improvements are to be made to the property of the Mansfield Light & Power Company, including the installation of two turbines, 2000 kw. and 4000 kw. respectively.

MIDDLESBORO, KY.—The power plant of the Puckett Creek Coal Company of Middlesboro was recently destroyed by fire, causing a loss of about $10,000.

GOSHEN, IND.—The Hawks Electric Company of Goshen has been granted a franchise to erect a transmission line from Wakarusa, 5 miles north of the town.

RICHMOND, IND.—Bids, it is understood, will soon be asked for the installation of an ornamental lighting system on Main Street. The cost is estimated at about $11,000.

CARLYLE, ILL.—At an election held recently the proposal to extend the transmission lines of the municipal electric-light plant to the village of Beckemeyer to furnish electrical service was carried.

CARROLLTON, ILL.—The installation of an electric-lighting system in Carrollton is under consideration. Bonds, it is understodd, have been authorized.

LORAINE, ILL.—The Loraine Electric Light & Power Company, recently incorporated with a capital stock of $2,500, proposes to supply electricity for lamps and motors in Loraine. Bert Van Blair, A. Van Blair and W. R. Hastings are interested in the company. By mistake this item appeared under Loraine, Ohio, in the issue of April 22.

PEORIA, ILL. — The Central Illinois Light Company of Peoria is contemplating extending its electrical service to South Peoria.

PEORIA, ILL.—Steps have been taken for the installation of ornamental lamps on Fulton Street similar to those on Adams and Jefferson Streets.

PEORIA, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 31 for extension of conduit and wiring and gas piping systems and lighting fixtures in the United States post office and court house at Peoria, Ill. For details see proposal columns.

SHABBONA, ILL.—The Village Board has granted the Northern Illinois Utilities Company a 20-year franchise to install and operate an electric-lighting system here. The company was also given a contract for street-lighting and for pumping water for the village.

URBANA, ILL.—Bids will be received at the office of James B. Debilka, state architect, 130 North Fifth Avenue, Chicago, Ill., until May 29 for construction of a Women's Residence Hall at the University of Illinois, Urbana. Separate bids to be submitted at the same time for plumbing, heating and electric wiring, and also for various branches for the general contract. Plans may be obtained at the above office upon deposit of $10.

WATERMAN, ILL.—The Illinois Northern Utilities Company of Dixon is contemplating extending its service to Waterman. Energy will be supplied from its plant in Paw Paw.

DE PERE, WIS.—Plans have been prepared by H. A. Smith, consulting engineer, Madison, Wis., for remodeling the power plant of the De Pere Electric Light & Power Company, at a cost of about $20,000. It is proposed to change the system from direct to alternating current. L. L. Tessier is superintendent.

ELKHORN, WIS.—Bids will be received by the Elkhorn Light and Water Commission until May 12 for the following equipment and machinery: One 40-hp. induction motor, slip-ring type, complete with panel and starter; one 40-hp. induction motor of the squirrel cage type, complete with compensator or starter; one 75-hp. induction motor, slip-ring type, complete with panel, starter, pulley and belt idler. Only one will be purchased, but bids are desired on both types. Bid on 75-hp. motor should be with and without idler. Charles Pieplow is secretary of commission.

SUPERIOR, WIS.—Plans are being considered for changing the entire street-lighting system in the residence districts, using incandescent lamps. The street-lighting service is supplied by the Superior Water, Light & Power Company.

WAUKESHA, WIS.—The Waukesha Pure Food Company is contemplating the construction of a power plant in connection with a factory to be erected in Waukesha. O. E. Glidden is manager.

ARGYLE, MINN.—A committe has been appointed by the Council to secure estimates for construction of electric-light plant and water-works system. C. J. Robertson is a member of the committee.

JACKSON, MINN.—Plans for improvements to the municipal electric-light plant, it is reported, are being revised by Earl D. Jackson, engineer, Capitol Bank Building, Minneapolis. The cost of the work is estimated at $20,000.

LITTLE FALLS, MINN.—The Little Falls Water Power Company is planning to erect a transmission line to Long Prairie, Wadena, Verndale and intermediary towns this spring. Franchises have been obtained in Long Prairie and Verndale.

MINNEAPOLIS, MINN.—Bids will be received by the Board of Education of the city of Minneapolis until May 15 for the construction of the Hiawatha School, including general work, heating, ventilating, plumbing and electrical work. Plans and specifications may be seen at the office of the Board of Education, 305 City Hall, and Rose & Harris, engineers, 470 Auditorium Building, Minneapolis.

MINNEAPOLIS, MINN. — Arrangements are being made to double capacity of the present water filtration plant and to install a water softening plant at a cost of about $1,000,000. Improvements contemplated include the replacement of two steam driven pumps at the Camden station with electrically driven pumps with a capacity of 25,000,000 gallons per day. In addition to the new pumps the equipment in the extension to the filtration plant will be operated by electricity. Energy for operating the water-works is supplied by the Minneapolis division of the Northern States Power Company.

FORT DODGE, IOWA.—Plans have been submitted by Burns & McDonnell, consulting engineers, Kansas City, Mo., for the hydro-electric power dam to be built on the Des Moines River north of the city. Bonds to the amount of $200,000 have been voted for this work.

GUTTENBERG, IOWA.—The City Council has accepted the proposal of the Schmidt Brothers & Company of Elkader to supply energy in Guttenberg. The city will install a distribution system, for which $10,000 bonds will be authorized.

MARATHON, IOWA. — Bonds to the amount of $12,000 have been voted for the installation of an electric-lighting system. A contract has been closed with the Peterson (Iowa) Power & Milling Company to supply energy to operate the system.

PERRY, IOWA.—The Iowa Railway & Light Company of Cedar Rapids, it is reported, has awarded the contract for construction of a new power plant in Perry, to cost about $100,000, to W. J. Zitterell & Company of Webster City.

RICKETTS, IOWA.—The installation of an electric distributing system, transformer station and erection of a transmission line from Charter Oak is under consideration. The cost of the proposed system is estimated at $4,000.

SELMA, IOWA.—Bids will be received by the consolidated independent school district of Selma until May 22 for construction of a high school building, including plumbing, heating, ventilation and electric wiring. Plans and specifications may be obtained at the office of H. W. Underhill & Company, Architects, Bryant Building, Kansas City, Mo., upon deposit of $10.

SWEA CITY, IOWA.—Bids will be received by the Board of Education of the consolidated independent school district of Swea City until May 16 for construction of a grade and high school building and remodeling the present school building, separate bids to be submitted as follows: (A) General contract; (B) heating and ventilating; (C) plumbing; (E) electric wiring. Plans and specifications are on file at the Builders' Exchanges at Minneapolis, Minn., and Des Moines, Iowa; at the office of the secretary of the board, Swea City, and at the office of Edwins & Edwins, architects, Northwestern Building, Minneapolis.

BURLINGTON JUNCTION, MO.—The Maryville Electric Light & Power Company has submitted a proposal to the Town Council offering to purchase the municipal electric-lighting system and furnish electrical service in Burlington Junction. If the plant is taken over the company will erect a transmission line from Pickering (the present terminus of the line) and supply electricity from the Maryville plant. Farmers along the line will also be served.

KANSAS CITY, MO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 22 for air washer, tempering coils, etc., in the United States post office and court house, Kansas City, Mo. For details see proposal columns.

REPUBLIC, MO.—The town officials are negotiating with the Ozark Power & Water Company of Bronson to secure electricity for commercial purposes.

SLATER, MO.—Bonds to the amount of $35,000 have been voted for extensions to the municipal electric-light plant and water-works system. L. E. Shepherd is superintendent.

SPRINGFIELD, MO.—The City Council has authorized the Springfield Gas & Electric Company to erect 61 additional street lamps, eight arc lamps and the others 200-cp. incandescent lamps.

NEW ROCKFORD, N. D.—An election will be held May 9 to submit to the voters the proposal to issue $17,500 for the installation of a municipal electric-lighting plant.

PIERRE, S. D.—Plans are being considered to extend the transmission lines of the local municipal electric-light plant to Faulkton, a distance of 10 miles, to supply electrical service there.

REDFIELD, S. D.—Bids will be received by the City Council of Redfield until May 18 for the construction of a new municipal power station and equipment, including boilers, engines, generators, piping, etc., and also underground steam main, in accordance with plans and specifications prepared by the Charles L. Pillsbury Company, engineers, Metropolitan Building, Minneapolis, Minn., and Tyrie & Chapman, architects, Auditorium Building, Minneapolis, Minn.

HARLAN, KAN.—The City Council is negotiating with the Solomon Valley Light & Power Company of Downs with a view of securing electricity for the city. D. D. McGuire of Downs is manager of the company.

LYONS, KAN.—The electric plant of the Lyons Electric & Manufacturing Company has been taken over by the United Water, Gas & Electric Company of Hutchinson, a subsidiary of the Cities Service Company of New York, N. Y. The local steam generating plant will be closed down and the transmission line of the United company extended from Nickerson to Lyons to supply energy here.

PITTSBURG, KAN.—A petition is being circulated for extension of ornamental lighting system on South Broadway for three blocks.

TOPEKA, KAN.—Improvements are contemplated to the State printing plant, Tenth and Jackson Streets, Topeka, including the installation of a 150-kw. generator driven by steam engine. C. H. Chandler, State House, Topeka, is State architect.

WAKEENEY, KAN.—Bids will be received at the office of J. H. Heckman, city clerk, Wakeeney, until May 22 for material and equipment for addition to water-works system as follows: (1) For furnishing and installing one 80-hp. oil engine; (2) one motor driven triplex pump of 200 gallons

capacity; (3) two 60-cycle, three-phase, 2300-volt generators with exciters and switchboard complete. Alternate bids on the above material will be received. For details see proposal columns.

Southern States

SALISBURY, N. C.—Plans are being considered by the Board of Aldermen for the installation of a municipal electric plant.

KNOXVILLE, TENN.—The city of Knoxville has entered into a contract with the Knoxville Railway, Light & Power Company for lighting the streets of the city for a period of ten years. Under the terms of the contract the company is to supply not less than 60 arc lamps and as many small incandescents as the city may order. The contract provides that the company shall supply electricity to maintain the ornamental lighting system on Gay Street from Hill to Jackson Avenues, Market Street from Clinch to Wall Avenues, Vine Avenue from Gay to Central Streets, and on Wall, Union and Clinch Avenues from Gay to Market Streets without charge. On Gay Street one 300-cp. lamp will be placed on each of the 94 iron trolley wire poles; the five-lamp cluster posts on Gay Street will be placed on Market Street, where the contract provides for 24 standards. The cost of the installation of the ornamental lamps is estimated at between $8,000 and $10,000 which will be paid by the city.

MANCHESTER, TENN.—The Board of Aldermen has appointed a committee to make investigations relative to the construction of a hydro-electric plant and waterworks system to be owned and operated by the municipality. George W. Leming is a member of the committee.

JACKSONVILLE, ALA. — The Public Service Commission has authorized the Jacksonville Light & Power Company to dispose of its entire property to the Alabama Power Company of Birmingham.

OPELIKA, ALA.—The Columbus Power Company of Columbus, Ga., is contemplating the erection of high-tension transmission lines from the Goat Rock hydroelectric power plant to Opelika, a distance of 22 miles. The cost is estimated from $80,000 to $90,000.

BALDWYN, MISS.—The city of Baldwyn has engaged Xavier A. Kramer of Magnolia as consulting engineer in connection with improvements to the municipal electric-light plant and water-works system, for which $10,000 in bonds were recently voted.

DE QUEEN, ARK.—The electric plant of the De Queen Ice & Light Company is reported to have been purchased by the Arkadelphia Light & Power Company. Extensive improvements, it is understood, will be made to the plant.

WINNSBORO, LA. — The Carl Shipp Electric Light & Power Company of Winnsboro will soon install a 50-hp. oil engine and a 35-kw. generator, and will also install a 25-hp. engine and 15-kw. generator to carry day load.

BLACKWELL, OKLA.—Bonds to the amount of $10,000 have been voted for extensions to the municipal electric-light plant. Plans and specifications have been prepared by the Benham Engineering Company of Oklahoma City.

CHANDLER, OKLA. — The Chandler Electric Company has been granted a new franchise for a period of 20 years. Extensive improvements will be made to the plant, including the installation of new equipment. A 24-hr. service will be established.

FORGAN, OKLA.—An election will soon be called to submit to the voters the proposal to establish an electric-lighting system in Forgan.

HYDRO, OKLA.—An election has been called to submit to the voters the proposal to grant a franchise to J. D. Palmer to construct and operate an electric-light plant in Hydro.

THOMAS, OKLA.—The City Council has passed a resolution authorizing the purchase of an oil engine for the municipal electric-light plant.

BALLINGER, TEX.—Plans are being considered by the City Council to install a new electric-light plant or to take over the local electric system.

BARSTOW, TEX.—The Barstow Public Service Company is preparing plans for the construction of a 1000-hp. electric plant, a 100-ton ice factory and water-works system with 800,000 gal. daily capacity, at a cost of about $200,000. The Tri-State Engineering Company of El Paso has charge of the engineering work.

FLOYADADA, TEX.—The City Council has granted the Texas Utility & Power Company a 50-year franchise to install and operate an electric-light plant here. Under the terms of the franchise a 24-hr. service is to be established and not less than $8,000 is to be expended in wiring the town.

GALVESTON, TEX.—Improvements involving an expenditure of about $10,000 are contemplated by the Brush Electric Company of Galveston to its power plant on Twenty-sixth and Post Office Streets.

GONZALES, TEX.—The Gonzales Water Power Company, it is reported, has awarded the contract for enlarging its hydraulic plant and installing additional equipment to L. D. McKaughan of Fort Worth, at $14,000.

KAUFMAN, TEX.—The Texas Light & Power Company of Dallas is extending its high-tension transmission line to Kaufman and will supply energy to the Kaufman Electric Light Company.

KINGSVILLE, TEX. — Extensive improvements are contemplated to the plant of the Texas Southern Electric Company at Kingsville, including the installation of a 750-hp. engine. D. A. Hagarty of Houston is president.

SHINER, TEX.—Bonds to the amount of $12,000 have been voted for the installation of a new plant or the purchase of the local system.

STOCKDALE, TEX.—G. A. Burris, it is reported, will install an electric-light plant in Stockdale.

WICHITA FALLS, TEX.—Bids will be received by the County Commissioners Court, Wichita Falls, until May 17 for construction of new court house building. Separate bids to be submitted for electrical work, heating and plumbing. Plans and specifications may be obtained from Sanguinet & Staats, architects, Fort Worth, upon deposit of $100.

Pacific States

EVERETT, WASH.—The City Council has appointed a committee to investigate the feasibility of establishing a municipal electric-lighting plant in Everett.

NORTH YAKIMA, WASH.—The officials of the United States Reclamation Service in North Yakima have been notified that $204,000 has been appropriated for the construction of a hydroelectric pumping plant, near Grandview, and the construction of pipe line and laterals for watering 4000 acres. The Grandview plant will generate 125 hp. and a similar unit at the head of the canal near Mabton will generate 175 hp. The cost of the machinery for the two plants is estimated at $109,000.

DALLAS, ORE. — Extensive improvements are contemplated by the Oregon Power Company, among which is the joining of the electric transmission lines of Dallas and Springfield plants. The Oregon Company operates power plants in Springfield, Albany and Dallas and supplies electrical service to most of the territory around these three centers. It is proposed to connect the end of the Polk County system at Independence with the wires from the Albany plant. The Albany and Springfield plants are connected. The work contemplated calls for the erection of new lines between Independence and Albany and will mean replacing the wires between Dallas and Independence. The output of the Springfield plant will be increased from 3500 to 500 kw.; the Dallas plant will be increased from 600 kw. to 2100 kw. Work, it is understood, will begin soon on the improvements.

HAMMOND, ORE.—The Town Council has granted the Pacific Power & Light Company a franchise to install and operate an electric-light plant in Hammond.

RICHLAND, ORE.—The Town Council has granted the Dry Gulch Ditch Company a franchise to install and operate an electric-lighting system in Richland for a period of 20 years. The company proposes to develop a water power on Eagle River and expects to be ready to supply electricity in Richland and a portion of Eagle Valley by Oct. 1.

LOS ANGELES, CAL. — The Pacific Light & Power Corporation of Los Angeles has applied to the State Railroad Commission for authority to exercise a franchise granted by Kern County for the erection of an electrical distribution system.

LOS ANGELES, CAL.—A permit has been granted for the erection of a two story brick and concrete machine shop at 1604 John Street in connection with the municipal distribution system at a cost of $12,000. The shop will be erected on the site selected for the municipal power station and will cost when completed about $60,000.

SACRAMENTO, CAL.—Plans are being considered by Thomas Coulter, commissioner of public works, for establishing a municipal electric-light plant in conjunction with a filtration plant.

SAN FRANCISCO, CAL.—The cost of installing the ornamental lamps for lighting the civic center is estimated at $40,000 and the expense of maintenance $13,000 annually. The plans provide for the use of 162 lamps.

SAN FRANCISCO, CAL.—Definite steps, it is reported, have been taken by the Southern Pacific Company for equipping its main line over the Sierras and the Siskiyou Mountains for electrical operation. A. H. Babcock of San Francisco is electrical engineer.

SAN FRANCISCO, CAL.—The public utilities committee of the Board of Works has agreed to allow $416,000 for Hetchy-Hetchy work, which the city engineer has planned for this year as follows: Lower Cherry Creek power development, $100,000; foundation for main Hetchy-Hetchy dam, $52,000; water rights and protection work, $30,000; additional permanent camps and equipment, $24,000; constructing roads and trails, $20,000; hydrography, $12,000; surveys of aqueduct line, $15,000; test borings on aqueduct line, $20,000; engineering and office expenses, $75,000; inspection and engineering in the field, $35,000; operation of sawmill, $10,000; completion of tunnel and dam, $23,000.

FARMINGTON, UTAH. — The Utah Power & Light Company of Salt Lake City has been granted a 50-year franchise to supply electricity in Farmington. The Council has decided to abandon the municipal electric system, which, it is expected, will be taken over by the Utah company.

PHOENIX, ARIZ.—Preliminary steps have been taken by the Water Users' Association looking toward the construction of a storage dam and reservoir on Verde River near Phoenix and the construction of a hydroelectric power plant.

SNOWFLAKE, ARIZ.—The installation of an electric power plant with sufficient output to supply electricity to three towns in Navajo County is under consideration by R. C. Smith of Snowflake.

DODSON, MONT.—Plans are being considered by the Commissioners of Phillips County fof the installation of an electric-light plant and water-system, to cost about $35,000.

LOVELOCKS, NEV.—The Nevada Valleys Power Company is contemplating extending its transmission line northward from Lovelocks to supply energy for mining purposes, general farming, pumping, etc. Edson F. Adams of Oakland, Cal., is president.

LAS CRUCES, N. M.—Investigations have been made of the Leasbury hydroelectric power proposition by the board of directors of the Water Users' Association. The cost of construction, equipment and erection of transmission line to Las Cruces is estimated at $60,000.

MAGDALENA, N. M.—The K-W Light & Power Company, recently incorporated with a capital stock of $50,000, contemplates the installation of an electric-light and power plant in Magdalena.

Canada

RODNEY, ONT.—A by-law authorizing the installation of an electric-lighting system will be submitted to the ratepayers. The cost is estimated at $7,000.

TORONTO, ONT.—The Ontaria Hydro-Electric Commission has arranged for the purchase of large group of water powers in the eastern part of Ontario, and will supply energy to over 140 separate municipalities, each of which has its own local commission for distributing electricity to consumers. The price paid for water powers is understood to be in excess of $20,000,000. A system of municipally owned railways with Toronto as base, to be financed on credit of Province of Ontario and on that of participating municipalities is also planned.

Miscellaneous

NOME, ALASKA.—At an election held recently bonds were voted for the installation of a municipal electric-lighting plant.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 20 for furnishing rubber-insulated, lead-covered cable, rubber-insulated, braided cable, ship augers, twist drills, steel drill sockets, engine truck springs, brass grommets, etc., under circular No. 1038. For further information address Major Earl I. Brown, general purchasing officer.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kneisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark. Convention, June 6-8.

ASSSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General Secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. O. Oschman, Oliver Iron & Steel Co., Pittsburgh, Pa. Annual convention, Chicago, Sept. 18-22.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, E. Brettell, Electric Supply Company, Ltd., Vancouver, B. C.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, James Redpath, 505 Rialto Building, San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, C. A. Littlefield, 130 East 15th St., New York.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, J. E. Kearns General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General Secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Next meeting, Hot Springs, Va., June 7, 8 and 9.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

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Printed in the First Issue of Each Month

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual meeting, Oklahoma City, May 23-25.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Wier, Athens, Ga.

ILLINOIS ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. L. Blumenthal, 179 West Washington St., Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, C. A. Littlefield, 15th St. and Irving Place, New York. Annual convention, Philadelphia, Sept. 18, 19 and 20.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

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INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary, W. H. Thomson, Jr., Des Moines, Iowa. Annual meeting, Dubuque, Iowa, May 10-12.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

JOVIAN ORDER. Jupiter (president), Thomas A. Wynne, Indianapolis, Ind.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Temporary secretary, E. A. Wright, Manhattan, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St., New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N., Minneapolis, Minn.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, R. H. Smith, Jackson, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis. Annual convention on steamer Quincy, May 11-13.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, New York, May 16-19.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York. Annual convention, Chicago, May 22-27.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Annual meeting, New York, July 18-22.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee. Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, E. H. LaTourneau, 602 Electric Building, Portland, Ore. Annual convention, Seattle, Wash., September.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Cedar Point, July 18-21.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus. Annual meeting, Cleveland, June 15 and 16.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION, Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Müller, 435 Sixth Ave., Pittsburgh, Pa. Annual convention, Eagles Mere, Sept. 5-8.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York. Annual meeting New York, May 9.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC LIGHT ASSOCIATION. Secretary, A. H. Savage, Dakota Light & Power Co., Flandreau, S. D.

SOUTHWESTERN SECTION, N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Texas. Annual meeting, Galveston, May 17-20.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Chas. W. Graham, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

UNITED STATES INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, W. S. Vivian, 19 South LaSalle St., Chicago, Ill.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WATER POWER DEVELOPMENT ASSOCIATION. Secretary, Marcus A. Beeman, Munsey Bldg., Washington, D. C.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,180,278. Speed Limit Indicator for Automobiles, Motorcycles and Other Vehicles; A. A. Austin, Denver, Col. App. filed Nov. 5, 1914. Indicates visibly and audibly the speed at which the auto is traveling.

1,180,286. Telephone Trunking System; E. D. Fales, La Grange, Ill. App. filed Dec. 1, 1908. Two-way for automatic systems.

1,180,293. Selective Signaling System and Apparatus Therefor; J. A. Hulit, Chicago, Ill. App. filed Oct. 21, 1911. For telephone train dispatching.

1,180,300. Signaling System for Elevators; D. E. Kilroy and W. A. Braden, Chicago, Ill. App. filed June 25, 1908. Operator can obliterate signals which cars otherwise would give.

1,180,328. Insulated Electric Conductor; W. F. Smith, Chicago, Ill. App. filed Oct. 3, 1913. Tape-wound wire for use in cables.

1,180,329. Rectifying Apparatus; H. C. Snook, Cynwyd, Pa. App. filed Dec. 26, 1908. Includes a high-tension polyphase rectifying switch.

1,180,348. Burglar Alarm System; J. M. Watkins, Buffalo, N. Y. App. filed Aug. 25, 1915. May be incorporated with watchman's call-box and fire-alarm circuits.

1,180,372. Apparatus for Treating Oils, Liquefied Greases and Fats, or Any Other Liquids with Nascent Ozone; A. Breydel, Brussels, Belgium. App. filed April 3, 1914. Utilizes all the nascent ozone produced.

1,180,397. Wire Clamp; D. C. Hooker, Farmington, Conn. App. filed Nov. 29, 1915. Simple construction adapted to fit any size wire.

1,180,414. Rectifier of Electric Currents; T. J. Murphy, Rochester, N. Y. App. filed Feb. 2, 1911. Particularly for circuits having considerable impedance.

1,180,426. Magneto Machine; E. Podlesak and B. R. Beckwith, Racine, Wis. App. filed May 7, 1915. Has E-shaped pole pieces.

1,180,444. Electrically Operated Sound Producer; C. J. Schwarze, Adrian, Mich. App. filed May 29, 1914. Prevents cracking of diaphragm.

1,180,445. Electromagnetically Operated Bell; C. J. Schwarze, Adrian, Mich. App. filed June 1, 1914. Employs a horseshoe magnet.

1,180,457. Magnetic Chuck; O. S. Walker, Worcester, Mass. App. filed Feb. 1, 1915. Has work-holding face adapted to retain large number of small pieces.

1,180,462. Telephone Receiver; B. D. Willis, Chicago, Ill. App. filed Oct. 28, 1908. Uses no permanent magnet and coils are in series with transmitter.

1,180,489. Magneto Machine; H. F. Geist, Racine, Wis. App. filed May 22, 1915. Of the solid motor type.

1,180,493. Electric Switch; G. H. Hart, West Hartford, Conn. App. filed July 27, 1915. Spring-pressed balls produce the snap movement.

1,180,494. Electric Switch; G. H. Hart, West Hartford, Conn. App. filed Aug. 3, 1915. Spring-pressed ball actuates switch arm.

1,180,510. Apparatus for Receiving Electrical Energy; C. D. Lansing, Dorchester, Mass. App. filed Dec. 26, 1905. Particularly for receiving from a distant point.

1,180,515. Signal Relay; J. F. McElroy, deceased, Albany, N. Y. App. filed March 26, 1912. Has a main and supplemental casing with resistance in supplemental casing.

1,180,545. Boiler for the Production of Steam or for the Evaporation of Solutions; H. Scheftlein, Christiania, Norway. App. filed Nov. 1, 1913. Nitrogen furnace of tube furnace type.

1,180,549. Remote-Control Switch; L. Siebenhauer, San Francisco, Cal. App. filed Feb. 11, 1913. May be readily reset in same manner as knife switch.

1,180,559. Secrecy Intercommunication Telephone System; W. P. Andrick, Jamaica, N. Y. App. filed Dec. 9, 1912. Complete secrecy with minimum contacts.

Record of Electrical Patents

Notes on United States Patents issued April 25, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,180,582. Regulation Employed in Temperature Regulating Systems Controlled by Thermostats; H. Emerson, Charleston, Mass. App. filed June 27, 1913. Local auxiliary sustaining circuit insures opening and closing of dampeners.

1,180,590. Signal; A. M. Lane, St. Louis, Mo. App. filed Dec. 1, 1913. Adapted for burglar alarm, railway cab signal, etc.

1,180,606. Day and Night Automobile Signal; E. O. Richardson, near Los Angeles, F. E. Bennett, Monrovia, Cal. App. filed March 30, 1915. Manually controlled signals at opposite sides of car.

1,180,614. Highly Refractory Article of Tantalum and Its Alloys; O. A. Simpson, Charlottenburg, Germany. App. filed Oct. 17, 1912. Tantalum covered with platinum.

1,180,635. Fusible Element for Electric Cut-Outs; R. C. Cole, Hartford, Conn. App. filed July 29, 1915. Insures rupture of fuse without weakening same.

1,180,638. Gas-Pressure Regulator; J. Fabian, Wilmersdorf, Germany. App. filed Feb. 26, 1913. Dependent upon the calorific value of the gas.

1,180,644. Circuit Interrupter; F. W. Harris, Wilkinsburg, Pa. App. filed Oct. 8, 1910. Oil-immersed, non-closable on overload.

1,180,648. Attachment Plug; Harvey Hubbell, Bridgeport, Conn. App. filed March 15, 1915. Separable type with break at same time on both sides.

No. 1,180,686. Illuminated Razor

1,180,720. Circuit Controller; W. K. Howe, Rochester, N. Y. App. filed Nov. 25, 1913. Three-position relay for railway signal.

1,180,729. Lineman's Shield; H. E. Marshall, Detroit, Mich. App. filed July 8, 1915. Has a completely insulated strap and fastener.

1,180,743. Electric Winding Mechanism for Clocks and the Like; F. J. Seabolt, Schenectady, N. Y. App. filed May 20, 1912. Time and strike mechanism of clock automatically wound by single motor.

1,180,751. Electric Switch; G. Wolff, Hermsdorf, near Berlin, Germany. App. filed Jan. 21, 1913. Overload type with means to prevent oscillation.

1,180,755. Locomotive; A. F. Batchelder, Schenectady, N. Y. App. filed Jan. 28, 1916. Sectionalized running gear for electric locomotives.

1,180,767. Cartridge Fuse; A. L. Eustice, Chicago, Ill. App. filed July 23, 1914. Link has two or more restricted portions.

1,180,776. System of Distribution; H. A. Laycock, Schenectady, N. Y. App. filed March 1, 1912. Special design of cut-off switch.

1,180,659. Junction Box for Electric Circuits; F. Kratz, Stuttgart, Germany. App. filed June 5, 1914. Fused junction box for concentric conductor cable.

1,180,680. Apparatus for Controlling Magnetic Chucks; O. S. Walker, Worcester Mass. App. filed March 14, 1914. Switch which directs reverse current through chuck wires.

1,180,686. Illuminated Razor; K. E. Allport, Chicago, Ill. App. filed June 7, 1913. Safety razor having a miniature lamp incorporated in the handle.

1,180,688. Jump-Spark Timer; C. H. Ashmead, Jr., Fort Lauderdale, Fla. App. filed Feb. 16, 1915. One electrode rotatable, other electrically slidable.

1,180,692. Telephone Drop; C. C. Bradbury, Chicago, Ill. App. filed Feb. 26, 1908. Permits removal of coil without disturbing movable parts.

1,180,719. Three-Position, Direct-Current Relay; W. K. Howe and O. A. Ross, Rochester, N. Y. App. filed Dec. 23, 1912. Of no larger size than two-position relay and face of armature locking.

1,180,780. Electric Signaling Attachment for Clocks; J. A. McDole, Chicago, Ill. App. filed Jan. 26, 1916. Contact member transverses a special path on clock face.

1,180,794. Electric Meter; W. H. Pratt and P. C. Morgenthaler, Lynn, Mass., and Fort Wayne, Ind. App. filed March 12, 1914. Induction type.

1,180,795. Electric Meter; W. H. Pratt, Lynn, Mass. App. filed April 2, 1914. Combined friction compensating and phase-lagging device.

1,180,800. Means for Changing the Frequency of Alternating Currents; A. M. Taylor, King's Heath, England. App. filed March 30, 1912. Obtains current of higher frequency without rotating machinery.

1,180,805. Oil Switch; R. Tröger, Charlottenburg, Germany. App. filed Oct. 11, 1912. Prevents explosions.

1,180,836. Electric Telegraph Apparatus; E. J. Galvean, Detroit, Mich. App. filed Feb. 7, 1913. For transmitting pictures.

1,180,838. Electric-Conduit Fitting; D. C. Gidley, Albany, N. Y. App. filed Oct. 6, 1910. May be adjusted axially and to different thicknesses of wall.

1,180,843. Automatic Telephone System; C. L. Goodrum, New York, N. Y. App. filed Aug. 16, 1915. Single stepping magnet for selective switch having directive and hunting movements.

1,180,851. Electric Heating System; L. P. Hynes, Chicago, Ill. App. filed May 5, 1913. For electric cars; heavy heating current controlled by sensitive thermostat.

1,180,914. Solenoid Switch; E. Gengenbach, New York, N. Y. App. filed June 7, 1913. Mounted in sheet metal housing.

1,180,917. Thermotelephone; O. Graetzer, Berlin-Lichterfelde, Germany. App. filed March 20, 1915. Wollostan wires may be mounted on the block after it is finished.

1,180,919. Advertising Device and the Like; H. K. Harris, London, England. App. filed Dec. 10, 1912. For making public announcements.

1,180,997. Electric-Lamp Socket; F. P. Gates, Hartford, Conn. App. filed July 15, 1915. Porcelain construction.

1,180,998. X-Ray Tube; J. D. Gibson, Denver, Colo. App. filed July 31, 1914. Positioning of main hollow anoid, with cooling and protecting means.

1,181,046. Electric-Lamp Switch; A. J. Tizley, New York, N. Y. App. filed Aug. 26, 1914. Pull switch embodieed in a candle fixture.

1,181,061. Writing Implement; J. A. Bettencourt, New Bedford, Mass. App. filed Oct. 13, 1915. Pencil having a transparent writing head and a built-in lamp.

1,181,066. Cross-Arm for Electric or Signal Wires; S. S. Cornelius, Corinth, Miss. App. filed Feb. 9, 1915. Has rounded top with a groove in the underside to receive the wire-supporting insulators.

1,181,076. Attachable and Detachable Electric Light for Batteries; J. G. Hobson, St. Louis, Mo. App. filed Nov. 16, 1914. Of sheet metal construction and spans the central battery terminal.

1,181,077. Process of Treating Ores Bearing Precious Metals; E. R. Holden, Los Angeles, Cal. App. filed June 16, 1915. Electrolytic solution subjected to rotary motion.

1,181,092. Common Battery Rotary Connector System; W. L. Campbell, Chicago, Ill. App. filed June 10, 1907. Has means for controlling the supply of talking current to the line circuits (forty-one claims).

1,181,093. Telephone Party-Line System; J. Erickson, Chicago, Ill. App. filed Sept. 15, 1906. Prevents flow of current through condenser when subscriber takes down the receiver.